TRANSPORTATION AND COMMUNICATION - Field TRIP

6

P. O. Box 239
Jeddah

Sadek Husseini
Director, Liaison Office
Saudi Arabian Government
Technical Cooperation Administration
Jeddah

Dear Mr. Husseini:

We expect to depart Jeddah on Tuesday Morning, April 28, to make another trip over the proposed railroad route between Jeddah and Riyadh.

Will you please advise the necessary authorities at the following locations to supply us with petroleum products required for this trip:

Yenbo
Medina
Anaiza
Marratt
Riyadh
Muwait.

Yours very truly,

INTERNATIONAL ENGINEERING CO., INC.

C. E. Buck
Project Manager

cc: J. A. Dunaway, TCA
E. F. Sinclair, TCA

CEB:wfb

INTERNATIONAL ENGINEERING COMPANY, INC.
74 NEW MONTGOMERY STREET
SAN FRANCISCO 5, CALIFORNIA

February 15, 1953

Mr. E. F. Sinclair
Chief, Transportation and Communications Division
Technical Cooperation Administration
Jeddah, Saudi Arabia

Dear Mr. Sinclair:

On or about Friday, February 20, we expect to send our next group to the field for the purpose of continuing the railroad survey.

This group will consist of four Americans and eight Saudi Arabs.

Will you please make arrangements, therefore, to have the Saudi authorities at the following locations aadvised so that arrangements can be made for picking up fuel, supplies, etc. along the route:

Yenbu,
Medina,
Anaiza and Riyadh.

Yours very truly,

INTERNATIONAL ENGINEERING CO., INC.

C. E. Buck

C. E. Buck
Project Manager

cc: Mr. Sadek Husseini, Jeddah

CEB:wfb

Talked with Sadek and he will arrange, including one guard - notified Charlie Buck.

EFS.
2/16/53

UNITED STATES OF AMERICA
TECHNICAL COOPERATION ADMINISTRATION

Jidda, Saudi Arabia
February 5, 1953

MEMORANDUM TO: Mr. John A. Dunaway
Acting U. S. Director of Technical
Cooperation in Saudi Arabia

FROM: Edward F. Sinclair, Chief
Transportation and Communications Division

RE: Field Trip Report

Messrs. G.E. Buck, N. Pearson and R. Varney of International Engineering Company, Mr. R. McKay of Saudi Arabian Railroad, Mr. Goudarzi and myself left Jidda at 7:00 am on January 16th for the purpose of making a ground survey of proposed Route No. 7 for the construction of a railroad line from Riyadh to Jidda. In making the round-trip to Jidda, we travelled approximately 1,980 miles.

From Jidda we went north through Rabigh to Yanbu, then east to Medina, and from Medina in a northeasterly direction to Anazia and Baraida. From Anazia we came south to a place called Salha, thence east across the Nafud Sirr to Shaqra, and then south through Murat, Dhruma, Al Kharj to Riyadh. From Riyadh we came through Murat, Duwadami, Sail Kabir to Jidda.

The only two points on the proposed Route 7 which gave us any considerable thought were getting in and around Medina and out of Riyadh. Incidentally, Route No. 7 was planned from Al Kharj, but our engineers feel that it is quite possible to bring the line out of Riyadh instead and thus continue the present railroad line. This was also considered from the fact that it is understood that Riyadh will be the headquarters for the entire railroad. The engineers felt that the entire trip was a complete success insofar as they were concerned as it showed that the most feasible route would be this Route 7 from a construction standpoint as well as serving the greater number of people.

On our return trip from Riyadh to Jidda we looked over Route No. 5, and it was the consensus that this route could be abandoned insofar as constructing a railroad was concerned due to various sections of rough terrain, mountains, etc, and the lack of population along the route.

At Yanbu, with a population of approximately 7,000, we visited the Amir and had quite a discussion as to the surrounding country and possible passes through the mountains to Medina, which information proved most valuable to us. While at Yanbu we made an inspection of its harbor facilities in company with the Amir, who, incidentally, is very desirous

of having

of having some improvements made in order that they might be in a position to handle more import tonnage than at present. After discussing the question of improvements to the habor, it was felt that considerable could be done there at a minimum expenditure, including the building of a wood piling pier on which could be laid a track for the off-loading and on-loading of commodities from boats direct to cars. The water runs to a depth of about 36 feet in some places and between 20 and 25 feet in other places, and the harbor itself is set back from the direct coast line by a very wide channel which would also help in sheltering ships. This would be an ideal spot for all materials destined to Medina and points east, north and south of Yanbu, and thus save the long motor trucking from Jidda. It would also serve as a very good harbor for receiving all materials for the construction of the proposed railroad, except that which is required in and about Jidda. We also noticed that there were several bags of charcoal on the dock which we were informed were being exported to Egypt. I tried to ascertain some figures as to this tonnage, but it was quite apparent that no such figures were being kept at the port. On the day following our visit to Yanbu they expected a ship in from Sweden with 500 tons of cement for use in Medina.

It also might stimulate the fishing industry from this point for supplying Medina and other points in that particular district. This would also serve as a very good port for people attending the Hajj ceremonies at Medina, and then going to Mecca via railroad. I am certain that it would prove to relieve the port of Jidda of some of the congestion which each year occurs during the period of the Pilgrimage.

You may wish to discuss this improvement in harbor facilities at Yanbu with the SAG authorities, thus giving Saudi Arabia another port on the Red Sea.

At Rabigh, which is about 100 miles from Jidda, I noticed while passing through there a considerable growth of date trees, and other vegetation, and thought perhaps Dr. Edens might wish to take a run up there to see just what help in agriculture could be given to thepeople. Also noticed a stream running just north of the village.

At Anazia, with a population of approximately 25,000, we met the Amir and Mosud Taji, Agricultural representative of the SAG. Mosud stated that he would very much appreciate a visit of our agricultural experts for advice and demonstrations in their village, which I noticed had a considerable supply of water. I noticed considerable wheat, alfalfa, tomatoes, pumpkins and other vegetables.

At Baraida we met Prince Abdullah Ben Mosud, the Amir, who greeted us most cordially. I noticed while there and in our discussion that they raise about the same type of commodities as Anazia, and Baraida, with a population of approximately 40,000, should also be visited by our agriculture people.

It was felt for the present that a rail-head should be set up on the new railroad line at a point approximately the same distance from

Anazia

Anazia as from Baraida, which are about 40 km. apart, and thus save the cost of constructing a branch line out of Anazia.

The engineers feel that no difficulties will be met in the construction of a branch line from Jidda to Mecca. Also, consideration will be given to constructing a track on the present pier at Jidda, i.e., whether the present construction will hold up under such a track, or will it be necessary to reinforce or construct an additional pier.

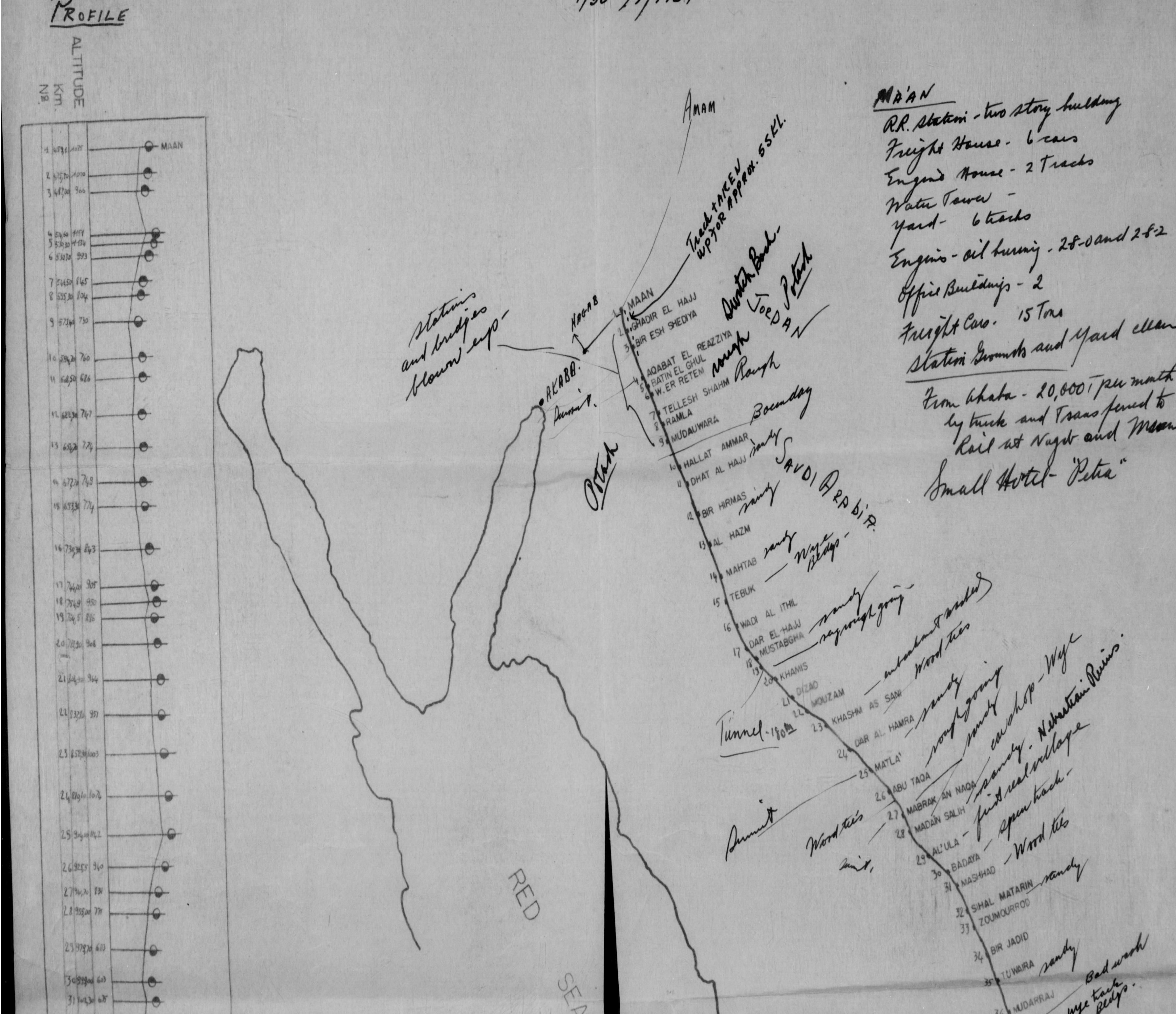
The line of new railroad to be constructed between Riyadh and Jidda on the proposed Route No. 7 will be in the neighborhood of 850 to 900 miles in length.

The next step in the railway survey will be the aerial photography, after which the Engineering Company will send out their men to set ground control for Aero Service.

I shall keep you currently informed of all matters concerning this project.

Attached hereto is a map showing the route we travelled.

1/30-2/7/1954

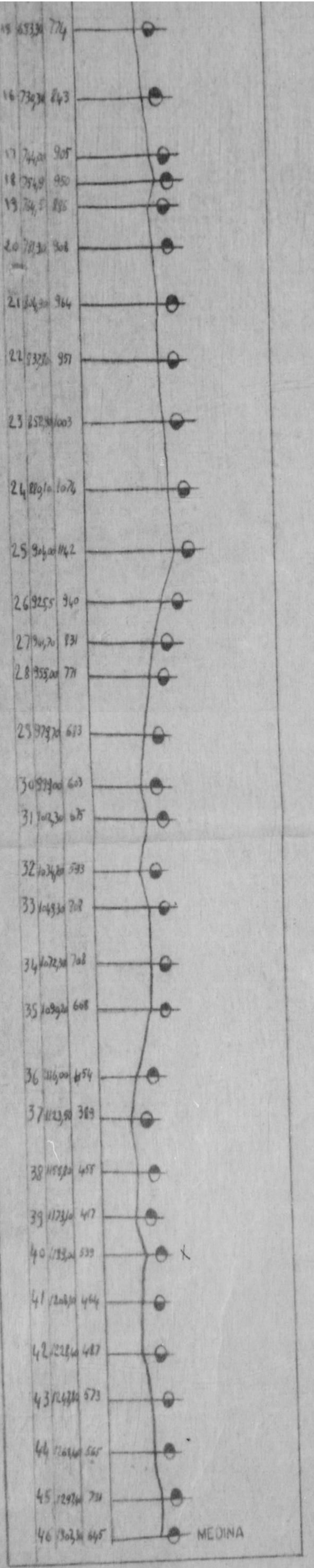


MA'AN

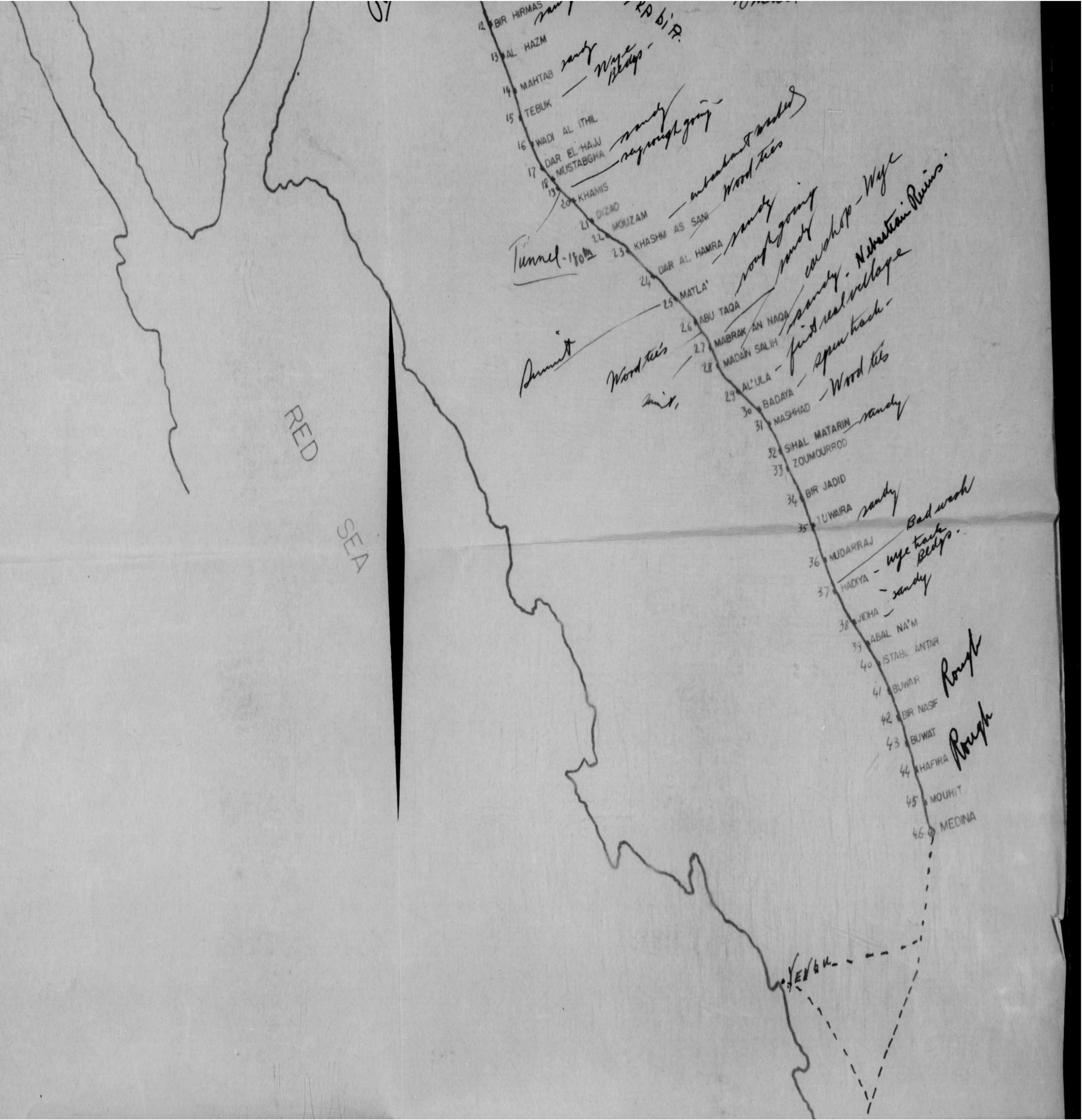
R.R. Station - two story building
Freight House - 6 cars
Engine House - 2 Tracks
Water Tower -
Yard - 6 tracks
Engines - oil burning - 2-8-0 and 2-8-2
Office Buildings - 2
Freight Cars. 15 Tons
Station Grounds and Yard clean

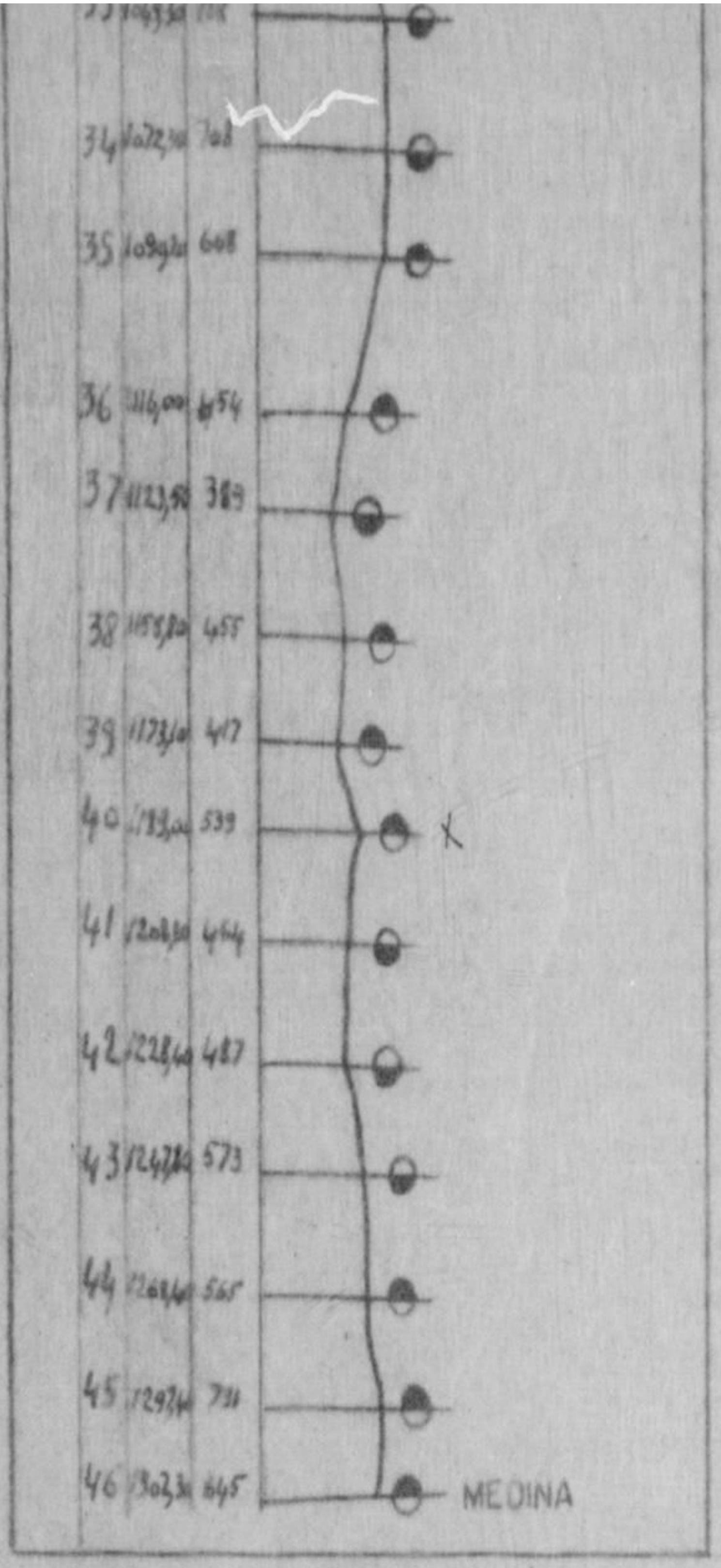
From Akaba - 20,000 T per month by truck and Transferred to Rail at Nagab and Maan.

Small Hotel - "Petra"

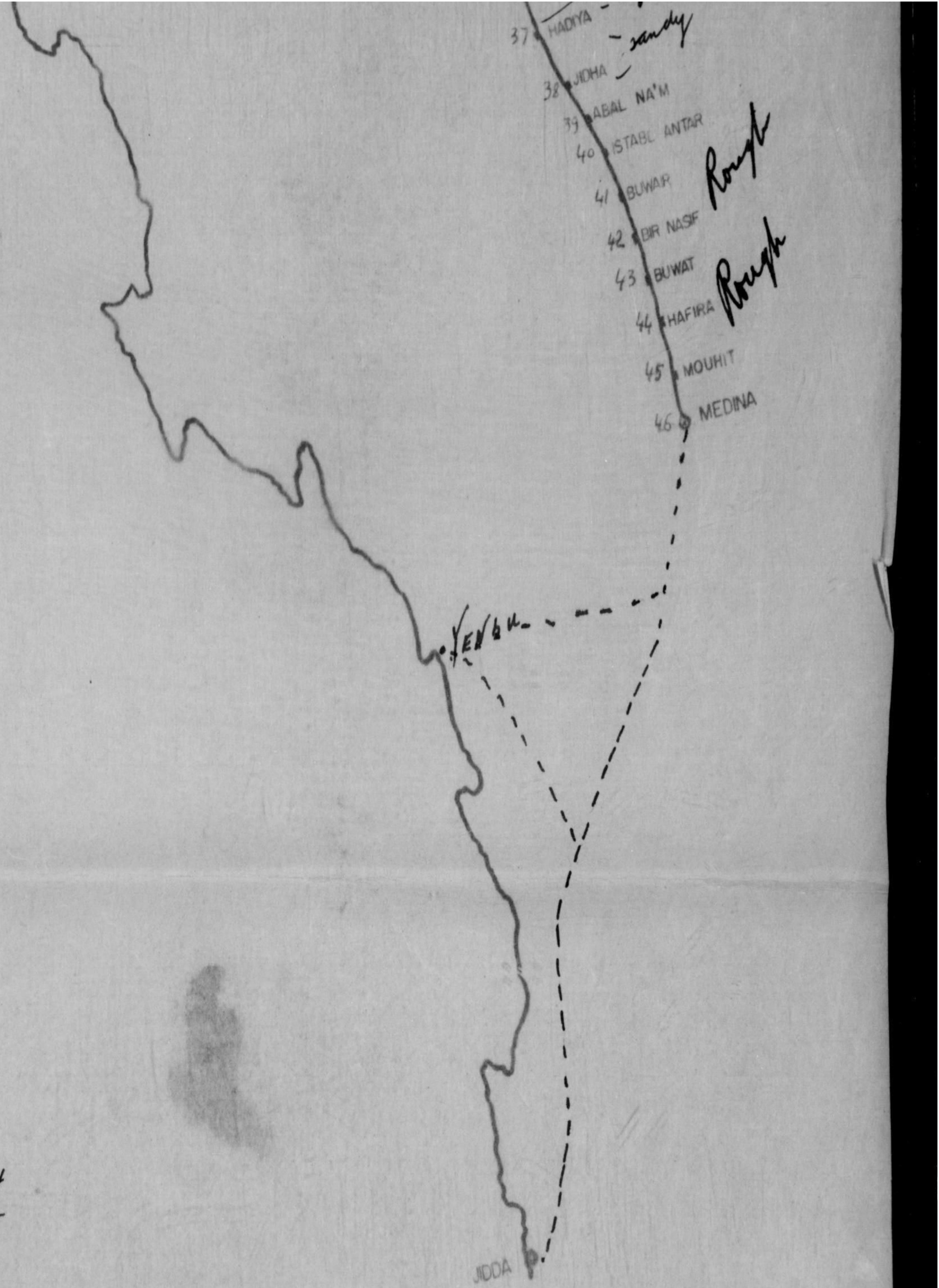


850.2 Km = 532. mi.





850.2 Km = 532. mi.



RAIL - 4¼" HIGH
BASE - 3½" WIDE
BALL of RAIL - 1¾" "
RAIL - 29'5 3" LONG
GAUGE - 3-43m WIDE
TIES - 6'3½" LONG
" - 22 PER RAIL

Grades - Some 1 to 2% -
generally below 1%.

Hejaz Railroad

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
USA OPERATIONS MISSION TO SAUDI ARABIA
American Embassy - Jidda

OFFICIAL - INFORMAL
UNCLASSIFIED

April 7, 1954

Dear Paul:

Supplementing my letter of February 18th, concerning the survey of the Hejaz Railroad:

Mr. Zahed only returned to Jidda this week, and I am enclosing herewith copy of the official report of the survey as submitted to the Joint Committee for the rehabilitation of this railroad composed of representatives from Jordan, Syria and Saudi Arabia.

We have been informed that there will be no action taken for the present in connection with restoring the railroad.

Sincerely yours,

Harland J. Corson
Director
USA Operations Mission to Saudi Arabia

Encl.
Report - Reconnaissance of
Old Hejaz Railroad

Mr. Paul Taggart,
Chief, Iraq, Saudi Arabia, Lebanon, Syria Division,
Near East, South Asia and Africa Operations,
Foreign Operations Administration,
Washington 25, D. C.

HJCorson/erm

MEMORANDUM:

The following is a report on the reconnaissance made over the Hejaz Railroad from Medina, Saudi Arabia to Ma'an, Jordan, by the Committee set forth below:

Mr. Bedia Oulaby, Syrian Representative
Mr. Fuad A. Zahed, Saudi Arabia Representative
Mr. C. T. Warren, Saudi Arabia Representative

In addition to the above Committee, the following persons made the reconnaissance with the Committee at the request of the Saudi Arabian Government:

Mr. E. F. Sinclair, Chief, Transportation and Communications, Point IV
Mr. Glen F. Brown, Chief, Natural Resources, Point IV
Mr. C. E. Buck, Consulting Engineer

The party left Jidda by plane on Saturday morning, January 30, 1954, and proceeded to Medina and from there travelled by motor convoy to Ma'an, Jordan, arriving Saturday, February 6, 1954.

The Hejaz Railroad is located in mountainous sections generally following the old pilgrim road. It follows along the wadis frequently crossing rough rocky terrain and flat gravel plains.

The railroad has deteriated due to nearly 40 years of non-use and lack of maintenance. Many severe washouts have been caused by violent desert storms. In many places the entire roadbed for long distances has been completely destroyed, for example, a section south of Hadiyah. At many of the washouts no culverts or bridges were built and those that had been constructed were too small to take care of the tremendous water flow resulting from "flash floods". Washouts at several locations where the flood channels changed will require construction of new culverts or bridges, and many will have to be repaired.

There were remarkably few rock slides on the track along the route, but sand was found to be 20 to 30 feet deep in some places where sand dunes had moved on to the track. Money has been provided in the estimate to cover the stabilization of sand dune areas.

A considerable part of the railroad will have to be rebuilt due to damage to the track from corrosion. Approximately 55 kilometers of track from Ma'an has been removed by the Jordan Government for use in the branch line to Nagab.

The buildings along the railroad can be restored to serviceable condition with a minimum amount of expenditure. However, the stations located in Jordan will have to be newly constructed. It will be necessary to provide pumps, power plants, etc. for fuel and watering stations along the route.

It is anticipated that radio communications will be provided for the length of the railroad.

To arrive at an accurate estimate of quantity and cost a detailed survey should be made in order to compile the necessary detailed information before any other steps are taken with respect to the restoration of this railroad.

No thought was given to a relocation of the present line. However, it was observed that there may be one or two places where the relocation of the line will make for better and more economical operation. This, however, can be determined after the survey has been completed.

Eleven wells were noted along the route and samples of water were collected for analysis. Pumps could be installed easily in these wells, the depth to water ranging from three to seventy-two feet beneath the surface of the land. Water in the hard crystalline rocks south of Al 'Ula is scarce, and water for the railroad must come from alluvial gravels in Wadi Hamda and tributary wadis. The larger supplies of water lie in the lower sections of the sandstone at Al 'Ula and northward. Artesian water at Tebuk has possibilities for agricultural development.

In addition to the water, fragments of an iron-bearing formation, a limestone series, and sedimentary beds of an age comparable to the phosphate beds in Jordan were seen. Studies of these formations may justify development of raw materials to be hauled on the restored railroad.

In restoring the Hejaz Railroad to normal operation it will greatly improve the economic conditions in all of the countries concerned, especially in Saudi Arabia, as it will be possible to ship fresh fruits and vegetables, as well as other commodities, into the country which will help in building up the standard of living as well as linking Saudi Arabia with other countries by means of a rail route. This will be of great importance to the Moslem world as a means of transportation to the Holy Cities of Medina and Mecca.

No consideration has been given in the estimate for new engines or other rolling stock to be used on the line. However, it is strongly recommended that serious consideration be given to the use of deisel locomotives.

It is estimated that the cost of rehabilitating the Hejaz Railroad from Ma'an, Jordan to Medina, Saudi Arabia, is approximately 40,000,000 Syrian pounds, this depending on a detailed survey of drainage areas which will determine the number of bridges and culverts required.

In considering the present investment in the railroad, the Committee feels that the above expenditure for restoration of the line is justified.

Dated at Damascus, Syria, the 11th day of February, 1954.

(Signed) Bedia Oulaby
(Signed) Fuad A. Zahed
(Signed) C. T. Warren

SCC-14577

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AGREEMENT

BETWEEN

THE UNITED STATES OF AMERICA

AND

INTERNATIONAL ENGINEERING CO., INC.

MEMORANDUM OF AGREEMENT made this 4th day of December, 1952 between the Government of the United States of America, represented by the Technical Cooperation Administration of the Department of State (hereinafter referred to as the "TCA") and the International Engineering Company, Inc.,(hereinafter referred to as the "Contractor"), a corporation organized and existing under the laws of the State of Nevada, with its offices and principal place of business at 74 New Montgomery Street, San Francisco, California.

This

WHEREAS, the Government of the United States of America, acting through the TCA, pursuant to the Act for International Development (22 U.S.C. 1557), is prepared, as part of its technical cooperation program with the Kingdom of Saudi Arabia, under the terms of a bilateral project agreement with the Government of Saudi Arabia, to cooperate with the Kingdom of Saudi Arabia in making a railroad survey to which both governments will contribute a part of the cost; and

This

WHEREAS, the TCA has determined that the Contractor is well qualified to make such a survey on its behalf, and that utilization of the Contractor's services will result in the most effective utilization of public and private personnel and facilities in carrying out the purposes of the Act for International Development in this instance; and

This

WHEREAS, the Contractor has indicated its willingness to furnish such a survey to the Kingdom of Saudi Arabia on behalf of the TCA;

NOW, THEREFORE, THE PARTIES HERETO AGREE AS FOLLOWS:

ARTICLE I

A. On behalf of the TCA and for the Government of Saudi Arabia, the Contractor shall make a railroad survey. In executing this survey, the Contractor shall perform all services subject to the inspection and acceptance of the United States Director of Technical Cooperation for Saudi Arabia or his duly designated representative (hereinafter referred to as the "Inspector").

this

1. Along the entire route of the railroad which shall extend from Riyadh to Jidda, the Contractor shall perform the following services with the degree of accuracy necessary for the letting of construction contracts and the securing of financing for the subsequent railroad construction:

   a. Select and locate with adequate markings, spaced at intervals not greater than 5 miles, the most advantageous route and guage from both an economic and engineering standpoint acceptable to the TCA and the Government of Saudi Arabia, and prepare the necessary maps and profiles showing the grades and curves;

   b. Furnish specifications, including quantities, qualities, and type, of the track and construction materials and grading required;

   c. Make definitions, including type and location on the maps and profiles, and a cost estimate, of drainage structures, sufficiently complete to enable the subsequent construction contractors to proceed with detailed field investigation and to prepare final detailed designs;

d. Make definitions, including type and location on the maps, profiles, and a cost estimate, of service structures, including bridges, sufficiently complete to enable the subsequent construction contractors to proceed with detailed field investigation, such as drilling for bridge foundations, and to prepare final detailed designs;

e. Make an estimate of the quantity and quality and location of materials available and suitable for ballast and of the cost of ballasting and track laying, including the estimated cost of track material.

2. Within the route from Riyadh to Jidda, the Contractor shall make a final fully staked-out location survey of fifty (50) miles of railroad with final detailed designs of drainage and service structures, including bridges, for the immediate starting of construction.

B. The Contractor shall complete and deliver, as the TCA shall direct, the railroad survey, acceptable to the Inspector, specified in paragraph A of this Article I, within 12 months after the entry into force of this Agreement.

C. The Contractor may, after advance notice to the TCA, enter into subcontracts with a subcontractor approved by the TCA for any aerial photography or mapping required in the performance of its services hereunder; provided, however, that no such subcontract shall be on a cost-plus-a-percentage-of-cost or a cost-plus-a fixed-fee basis.

D. The Contractor shall furnish all materials, equipment, and supplies required for the performance of its services under this Article. On the conclusion of its services under this Agreement, the Contractor shall place in good serviceable condition and deliver to the TCA, as directed by the Inspector, all non-expendable equipment and unexpended materials and supplies purchased by it for use under this Agreement. The Contractor shall maintain and furnish to the TCA on conclusion of its services hereunder an accurate inventory of such equipment, materials, and supplies, and shall at its own expense replace any such non-expendable equipment lost, destroyed, or damaged due to negligence of the Contractor or of his subcontractors, agents, or employees, but shall not be otherwise liable for loss of or damage to such equipment. Title to such non-expendable equipment shall be in the United States Government at all times.

E. The services performed and the materials, supplies, and equipment furnished by the Contractor under this Agreement shall be in accordance with a budget and table of equipment prepared by the Contractor and approved by the TCA, which shall specify the personnel employed by the Contractor under this Agreement, and the schedule of salaries to be paid to such personnel, and all materials, supplies, and equipment of a value of over $100 per item to be supplied by the Contractor, and shall contain an estimate of other expenditures to be made by the Contractor under the Agreement. These documents may be subsequently supplemented and revised with the approval of the Inspector.

F. The Contractor agrees to replace any employee serving in Saudi Arabia hereunder on the request of the Inspector.

ARTICLE II

A. In consideration of the Contractor's undertakings under this Agreement, the TCA shall reimburse the Contractor in U. S. dollars for the U. S. dollar costs incurred by it in performing such undertakings and in addition shall pay the Contractor a fee in U. S. dollars fixed at $26,000; provided that the total payments to the Contractor hereunder shall not exceed $330,000. Costs for which the Contractor shall receive reimbursement hereunder shall consist of the items of direct cost provided for in the Contractor's budget specified in Article I, section E hereof, plus overhead expenses calculated at a provisional rate of 15% of the direct salaries and wages of overseas personnel reimbursed by the TCA under this Agreement and 60% of direct salaries and wages of personnel in the United States reimbursed by the TCA under this Agreement, subject to adjustment to the actual overhead rate as determined on audit by TCA of the accounts of the Contractor on the completion of the Contractor's services under this Agreement.

This

B. Reimbursements to the Contractor under the Agreement shall be made by the TCA on the basis of properly certified vouchers submitted to it by the Contractor no oftener than monthly and accompanied by such supporting documents as the TCA shall request. Payment of the fee specified in Section A of this Article II shall be in ten equal monthly installments of $1,950 each and the remainder on completion of the Contractor's services hereunder.

This

C. The Administrator of TCA, and the Comptroller General of the United States, or any duly authorized representative of either, until the expiration of three years after final payment hereunder, shall have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor or any of his subcontractors engaged in the performance of and involving transactions related to this Agreement or sub-contracts thereunder.

ARTICLE III

TCA shall endeavor to arrange, under the bilateral project agreement between the Government of the United States of America and the Government of Saudi Arabia with respect to the railway survey project, for the furnishing to the Contractor by the Government of Saudi Arabia of the following:

1. A sum in Rials equivalent to $27,000, out of which the Contractor shall pay the Rial cost of food for its personnel, petroleum fuel and lubricants, local Saudi Arabian labor, and miscellaneous Rial expenses.

2. Adequate housing for the Contractor's project manager and family in Jidda, and for 10 single men in Jidda and Riyadh as the Contractor shall require.

3. Canteen privileges and use of laundry facilities for personnel in Jidda and Riyadh and the use of shop facilities for the repair of equipment.

4. Suitable office space for the Contractor's headquarters for this project in Jidda.

5. Police protection when and if required by the Contractor in any area in Saudi Arabia.

6. Aircraft and crews and all expenses for preliminary air reconnaissance of proposed railroad routes, as required by the Contractor.

7. Access to and prints of any existing available aerial photographs of the proposed railroad right-of-way.

8. An agreement to hold the Contractor harmless from civil suits brought against the Contractor by third parties for injury or property damage arising out of the carrying out of the railway survey project.

9. The same treatment with respect to taxes, customs and import duties, service charges, investment or deposit requirements and currency controls for personnel of the Contractor, other than Saudi Arabian personnel, engaged in performing services under this Agreement and for funds, materials, and equipment introduced into Saudi Arabia by the Contractor and used in performing such services as is provided for personnel and funds, materials, and equipment of the Government of the United States under the terms of Article III, section 2, and Article IV of the General Agreement for Technical Cooperation between the United States of America and Saudi Arabia signed at Jidda on January 17, 1951.

10. The exemption of the Contractor from all Saudi Arabian corporate and business taxes applied to it solely by reason of its activities under this Agreement.

In the case that the Government of Saudi Arabia fails to furnish any of the foregoing, an equitable adjustment of the items for which the Contractor shall receive reimbursement and of the maximum limit established for payments under this Agreement shall be made by agreement between the TCA and the Contractor. Failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meeting of Article IV of this Agreement.

ARTICLE IV

Except as otherwise provided in the Agreement, any dispute concerning a question of fact arising under this Agreement which is not disposed of by agreement shall be decided by the Inspector, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. Within 30 days from the date of receipt of such copy, the Contractor may appeal by mailing or otherwise furnishing to the Inspector a written appeal addressed to the Administrator of TCA, and the decision of the Administrator or his duly authorized representative for the hearing of such appeals shall be final and conclusive, provided, that if no such appeal is taken, the decision of the Inspector shall be final and conclusive. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Agreement and in accordance with the Inspector's decision.

ARTICLE V

In the performance of work under this Agreement, the Contractor agrees not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin; and further agrees to insert the foregoing provision in all sub-contracts hereunder except sub-contracts for standard commercial supplies or for raw materials.

ARTICLE VI

No member or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ARTICLE VII

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability or, in its discretion, to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE VIII

This Agreement shall enter into force when signed by the parties and shall remain in force for a period of twelve months thereafter, unless previously terminated as provided herein.

This Agreement may be terminated by the TCA (1) whenever the Contractor shall default in the performance thereof, as determined by the Administrator of the TCA or the Inspector; or (2) whenever the Administrator of the TCA shall determine that such termination is in the best interests of the TCA. Termination shall be effected by delivery to the Contractor of a written notice of termination specifying whether termination is for the default of the Contractor, in which case it shall be effective immediately on receipt of notice, or at the option of the TCA, in which case it shall be effective 30 days after receipt of such notice. In the case of termination at the option of the TCA, the Contractor shall be reimbursed for all expenses irrevocably incurred and unpaid by it prior to the date of termination, including the expenses of liquidating claims of employees under the terms of their respective employment contracts, and shall receive compensation including a portion of its fee for all services performed by it prior to the date of termination. In the case of termination for default of the

Contractor, the Contractor shall be reimbursed for all expenses incurred by it prior to the date of termination, but shall receive no part of the fixed fee for its services under this Agreement.

This Agreement may be extended, amended, or supplemented at any time by agreement of the parties hereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

FOR THE INTERNATIONAL ENGINEERING COMPANY, INC.:	FOR THE GOVERNMENT OF THE UNITED STATES OF AMERICA:
Fred J. Huber /s/	Stanley Andrews /s/ Administrator Technical Cooperation Administratio

USA OPERATIONS MISSION TO SAUDI ARABIA
Jidda

February 20, 1954

MEMORANDUM

TO: Mr. Clifford R. Nelson
American Embassy, Jidda

FROM: Harland J. Corson, Director
USA Operations Mission to Saudi Arabia

SUBJECT: Report on Preliminary Survey of Hejaz Railway.

As requested, I am sending you a copy of Ed Sinclair's memorandum covering the preliminary survey of the Hejaz Railway.

Encl. -
As above

Dist. Total	km. Inter-med.	Alt. ft.	Station	
113-00	15.40	2,385	Qal'at el Mudawwarah (Turk. Mudevvereh)	Two stone buildings on W. side of line. Two sidings of 250 yards each. Well yeilding 5,300 gallons a day (water at 80 ft.); steam and windmill pumps. Stone water-tower, carrying two iron tanks. Disused engine-shed for 2 engines. Old fort (stone) on pilgrim route 2 miles to W. on hills. Fair well, yielding 3,300 gallons a day; and an Arab encampment. Blockhouse. One loop-siding, 13 sunken barrels in 1907. Only 17 culverts between Mudawwarah and Qal'at el Ahmar. About 10 km. S. of Mudawwarah are some small wadis draining into a depression with salt incrustation W. of the line. From km. 128 the line ascends gradually. North of Qal'at el Ahmar line curves E. to avoid sand dunes.
135.57	22.57	2,469	Qal'atel-Ahmar	Stone building on E. side of line; loop-siding. No natural water; 6 sunken barrels in 1907. Line descends by an easy gradient. Guard house; 1 loop-siding; 2 tents; 4 sunken barrels in 1907.
147.50	11.93			Bridge. Five arches of 4 metres each
149.50	2.00		Dhat el-Hajj (Zat el-Hajji	Station with 1 loop-siding and 2 stone buildings on E. side of line. Well with abundant water; water-tower, steam and windmill pump; $\frac{1}{4}$ mile E. is an old fort or qal'ah on the pilgrim route standing in a little lonely oasis on the edge of a barren plain; water is plentiful a few inches underground. In

				the qal'ah is a well of good water 1 metre below the surface; outside is a large stone reservoir. There are about 100 palm trees, the remains of old palm gardens. The water drains into a depression to the NW. Camp of Huweitat Arabs. After Dhat el Hajj there is, on an average, one culvert per km. for the first 10 km., and then only 1 on the next 12 km. After km 152.50 the line ascends slowly. For the first 12 km., the country is undulating with a line of low hills to the E. Then the line enters a plan, at first narrow like a valley, but soon opening out to a width of 9 or 10 km.
173.00	23.50	2,054	Bir Hurmas	Station building on E. side of line; 1 loop-siding. Well, yielding 18,000 gallons a day; water 3 or 4 feet below ground level. Water-tower with iron tank, fed by windmill and steam pump. At Bir Hurmas, the plain widens yet further; the ground is sandy with stony patches, and very level. The line of hills on E. ceases, and the country is flat for 50 or 60 kilometres. On W. is a line of hills, 15 or 20 km. distant. The ground drains imperceptibly eastward, where a lake (Khabrat el-Muhtatah) forms in wet weather. Only 7 culverts in this stretch.
195.50	22.50	2,126	Hazm	Stone blockhouse on W. side of line; 1 loop-siding; no water. Line traverses sandy and stony desert. Row of hills visible on E. with one very prominent summit, Jebel Sherura. Only 7 culverts on first 16½ km.

218.50	23.00	2,200	Mahtab	Stone blockhouse on E. side of line; 1 loop-siding; poor well of brackish water. Several culverts N. and S. of Mahtab over shallow wadis, which drain (as do the Tebuk oasis and Wadi Ithl) into the shallow depression mentioned above. Salt flats are left by the drying water, and there is much salt in the ground everywhere till Tebuk is reached. Jebel Sherura, E of the depression and about 25 km. distant,is called Mimbar en-Nebi "The Prophet's Pulpit," by the Bedu, who sometimes resort to it for religious purposes. The Sherarat are reported to visit the range to the E. of Sherura.
233.00	14.50	2,249	Tebuk	Important oasis. Railway depot. Station on W. side of line, except engine-shed on SE. All stone buildings with tiled roofs. Repair shop (hand tools), stores, triangle, guard-house. Well, 22 meters deep, yielding 90,000 gallons a day. Water-tower with 2 tanks, steam pump, and windmill pump. Military hospital 1 mile S. of station. One the line, 1½ km. S. of station, in the sand, is a quarantine station - a large wired enclosure on each side of line. These are subdivided into small compounds in which tents are pitched. The dictors and disinfectors have wooden huts. Tebuk village is on a slight rise SW of station. Between the station and village is a prominent stone mosque built in 1907 by 'Abd er-Rahman Yusuf. Village has about 60 mud houses with perhaps 300 inhabitants. Amongst the inhabitants is Sheikh Harb of the Beni 'Atiyah. The village is enclosed is a horse shoe of palm gardens (about 1,000 trees), open towards the railway; groves of about 100 yards deep, and perhaps 1,000 yards long; water everywhere, 2 to 3 metres down; a few vines, some figs and pomegranates

				On W. side of village and gardens is the qal'ah and spring. The former is 27 metres square of stone, and contains a well. The spring is only a few yards away, and runs into three cemented basins; the yield is about 10,000 gallons a day; temperature 81° Fahr., slightly brackish. The well water is excellent. The oasis people are not Bedu but slaves, etc. who have settled there. There is a good view from behind the village of hills to W. From Tebuk the line runs over a monotonous plain of open flat sand and stone with occasional scrub. After a short time the course of the large Wadi Ithl may be traced by the tamaris trees along its banks. This wadi and Wadi Akhdhar occasionally flood into Khabrat el-Muhtatah.
261.00	28.00	2,743	Wadi Ithl	Stone blockhouse on E. side of line, and loop-siding. No water. Trees near the station. One km. N. of the station is the longest bridge of this part of the line (143 metres); 20 arches of 6 metres each, strongly built, but only 4.50 metres high to their crown, on piers 1.5 meters thick. Deviations easy. The wadi floods, sometimes twice in a winter. There is another bridge of 12 2-metre culverts shortly after.
			Guard-house	The line continues between the limestone hills, following up the valley on to a very broken plateau, with bare hill-tops and deep sandy valleys.
285.00	24.00	2,944	Dar el-Hajj	Loopholed stone station building on E. side of line. One loop-siding; no water. Country continues very broken with ravines cutting into it. The line crosses Wadi Ghadai (trees) about 7 km S. of Dar el-Hajj, and two other wadis by stone bridges.

296.00	11.00	3,084	Mustabghah	Fortified stone blockhouse on E. side of line; 1 loop-siding; no water. Station lies in a hollow. The line then enters a narrow sandstone gorge, and after a deep cutting, blasted out of hard rock, passes through a tunnel, about 180 metres long, through a spur. The tunnel opens into a deep wadi with sides often precipitous. The line follows it in a series of sharp curves (some of only 125 metres radius) on a down gradient to Q. el-Akhdhar. Between Dara el-Hajj, Mustabghah, and Qal'at el-Akhdhar, the gradients are sometimes 18$^{o}/_{oo}$.
301.00	5.00	2,870	Qal'at el-Akhdhar (or Khudhr)	Fortified station building, E. of line; 1 loop-siding. Water from well about 10 metres deep, pumped by steam pump into a cistern holding 40,000 gallons. No more water till Mada'in Salih. Four miles SE. of the station on the pilgrim road in a narrow valley is the qal'ah. Some vegetation, of rimth, and acacia, etc. Good water from well, 9-10 metres deep and 2 metres wide. Four cisterns outside the fort. Camp of Suweiflah Arabs. The line runs on along Wadi el-Khamis (further called Wadi es-Sani), a waterless affluent of Wadi el-Akhdhar. A good deal of camel thorn and acacia.
305.00	4.00		Moqsadat ed-Dunya	Stone bridge about 5 meters each in span, 15 arches.
318.00	13.00			Stone bridge of 15 arches, about 12 ft. high to crown; span probably about 5 metres each.
322.00	4.00		Khamis	Near the mouth of Wadi el-Hamas. Bridge, loop-siding, and blockhouse on E. of line. No water, a few trees. The hills on the left cease, and the valley widens to 1,200 yards. Line passes a number of acacia trees)Jenein el-Qadhi) a few kilometers up Wadi es-Sani.

346.00	24.00	3,143	Dizad	Blockhouse on E. side of line, and loop-siding. No water; some trees and bushes at the end of Wadi es-Sani. Thence up Wadi Mu'adhdham, a deep curving wadi, with plenty of desert vegetation and some trees. Many shap curves, one of 128 metre radius.
369.00	23.00	3,185	Wal'at el-Mu'adhdham (mu'azzam)	Stone building on W. side of line; 1 loop-siding; no water. Old fort (no well), a few hundred yards from the station. Cistern 4 or 5 metres deep (capacity, 12,000 cubic metres;) it was filled by a flood in 1907, and, when so filled, its supply may last for some time. In a plain about 1 km. wide, at the junction of the wadis. The hills on the W. are smaller than those to the E. Good view up the valley to S. Poor encampment of Suweiflah Arabs. The place is visited by Beni'Atiyah, Billi, Aida, Shammar, Fuqara and Sherarat. It is the station for Ha'il, which can be reached by motor in one day. After Qal'at el-Mu'adhdham the line enters very bare broken country, the foothills of Jebel 'Aweridh. Vegetation in Wadis Saba, 'Ashiyah, and Ghumar, but no water.
394.00	25.00	3,233	Kishm ez-Zanah (or Sana)	Loop-siding and blockhouse on W. side of line, in a valley between steep slopes, no water. After this, a small wood of tamarisks, etc; thence up Wadi Ghumar by an easy gradient of worn sandstone with basalt and lava outflows in places.
421.00	27.00	3,585	Dar el-Hamra (Dhahr el-Hamra)	Stone station building, loop-siding. Station loopholed on usual pattern; on E. side of line; no water. 4 Km. W. of the station is a ruined qal'ah, on the pilgrim road. Well, usually dry, cistern (capacity 18,000 cubic metres), filled by flood water, is often dry, and the water at other times is generally bad. Thence through very broken red sandstone country past Riqat es-Sa'id Pasha, and over a watershed (3,752 ft.) to
445.00	24.00	3,743	Matali	Blockhouse on E. side of line and loop-siding; no water. Line passes a pass through Shuq el-Ajuz. Very broken country. Thence

				by gradients of $14^{\circ}/_{oo}$ down to Wadi Abu Taqah. In spite of the embankment trains are here often stqped or derailed by the sand.
459.00	14.00	3,139	Abu Qaqah	One loop-siding and blockhouse on E. side of line; no water. Very broken country, with isolated pinnacles of red sandstone and deep sand.
471.00	12.00		Mushim	1 loop-siding and blockhouse on E. side of line. Line passes through a narrow pass, skirting W. face of Mabrak en-Naqa'. Fantastic sandstone rocks worn by wind-blown sand. No water; a few trees and bushes. Descent into Meda'in Salih plain.
496.00	25.00	2,538	Meda'in Salih	Loop-sidings; large engine-shed; 3 stone houses; 2 blockhouses and a water-tower fed by a steam pump on W. side of line. Water about 9 metres below ground level. Repair shops and usually a military camp. On the pilgrim road is a qal'ah, about 20 metres each way; in its courtyard is the Bir en-Naqa, 26 ft. to water. Noria wheel filling cistern of about 2,000 cubic metres; water slightly medicinal. Encampment of Fuqara Bedu. Interesting Nabataean tombs near the line.
511.00	15.00		Wadi el-Hashish	Loop-siding, and stone blockhouse. (Intermediate distance uncertain).
531.00	20.00	2,213	El'Ala (el-'Ula)	Siding; stone station building of two stories; water tower and blockhouse on W. side of line, at place called [illegible] Manshiyah, 3 km. S. of El-'Ala village. The station well is sometimes violently purgative, but the water of underground canals in Manshiyah gardens is very good. For a description of El-;Ala, see I, p. 115 F. A track leads to Wejh; see below, Route No. 31, pp. 184 ff. From El-'Ala onwards the plate-laying, ballasting, and earthwork of the line are all bad, and the average speed in 1914 was only 15 km. per hour.
551.7	20.7	1,956	Beda'i	Water. Loop-siding.

565.0	13.3	2,194	Meshed	
576.9	11.9	1,924	Seil Matara	
592.0	15.1	2,301	Qal'at ez-Zumurrud (or Zumrud)	Water; four wells. Qal'ah on pilgrim road. Line then crosses watershed (2,567 ft.)
604.3	12.3	2,301	Bir Jedid	
622.3	18.0	2,171	Toweira	
648.0	25.7	1,475	Mudurij	
665.	17.5	1,264	Hadiyah	Water; eight wells. Station for Kheibar; see below, Route No. 21 pp. 148 ff.
687.8	22.3	1,479	Jedaha	
705.1	17.3	1,527	Abul-Na'im	Water. Four hrs. to Medina by ordinary train.
721.0	15.9	1,719	Istabal 'Antar (Hareimil)	
740.8	19.8	1,508	Buweir	Water tower.
760.4	19.6	1,583	Bir Nasif	
775.8	15.4	1,859	Bowat	Village of Bowat, about 12 miles to W.
796.4	20.6	1,861	Hafirah	Water
815.4	19.0	2,243	Muheid	
830.3	14.9	2,096	Medina.	Water/station of 17 stone buildings (single storied); turntable and sidings. For description of town see I, p. 116f.

Hejaz RR ①

USA OPERATIONS MISSION TO SAUDI ARABIA
American Embassy - Jidda

OFFICIAL - INFORMAL
UNCLASSIFIED

February 18, 1954

Dear Paul:

Following my letter to you dated February 1 relative to a preliminary survey of the Medina-Ma'an Railway which, as you know, was destroyed during World War I, Mr. E. F. Sinclair, Chief of our Transportation and Communications Division, who accompanied the party on such survey trip, has returned and has handed me the attached memorandum covering findings. As soon as Mr. Fred A. Zahid, Chief Engineer of the Ministry of Communications who led this party, returns to Jidda, I will get from him a copy of the official report and will forward same to you immediately.

It is interesting to note from the attached memorandum that the above party found the line in fairly good condition in spite of the fact that it has not been used or maintained for approximately forty years; also, that their estimate of the cost of restoring the line is in the neighborhood of $11,500,000 to $12,000,000.

At the time of sending you the official report on the abovementioned survey, I will give you any additional information which may be available at that time.

Sincerely yours,

HJC
Harland J. Corson
Director
USA Operations Mission to Saudi Arabia

Encl.
Report - Inspection Trip of
Old Hejaz Railroad

Mr. Paul Taggart,
Chief, Iraq, Saudi Arabia, Lebanon, Syria Division,
Near East, South Asia and Africa Operations,
Foreign Operations Administration,
Washington 25, D. C.

HJCorson:o

UNITED STATES OF AMERICA
~~TECHNICAL COOPERATION ADMINISTRATION~~
USA OPERATIONS MISSION TO SAUDI ARABIA
Jidda

February 14, 1954.

MEMORANDUM TO: Mr. Harland J. Corson,
Director.

FROM: E. F. Sinclair, Chief, Transportation and
Communications Division.

RE: Inspection Trip of Old Hejaz Railroad.

On Saturday, January 30th, the following party left Medina via motor truck enroute to Ma'an, Jordan, for the purpose of inspecting the old Hejaz Railroad:

Mr. Fred A. Zahed, Chief Engineer, Ministry of Communications, Saudi Arabia.
Mr. C. T. Warren, Chief Engineer, Saudi Government Railroad, Dammam.
Mr. C. E. Buck, Consulting Engineer, Beirut, Lebanon.
Mr. Bedia Oulaby, Engineer, Syrian Government, Damascus.
Dr. Glen Brown, Chief, Natural Resources Division, Point IV, Jidda.
Mr. E. F. Sinclair, Chief, Transportation and Communications Division, Point IV, Jidda.

The party arrived in Ma'an on the evening of February 6th, after an eight day trip across the desert.

All members of the party were very agreeably surprised to find the old line in such good condition insofar as rail, ties and other track material and buildings were concerned. Also, the roadbed, although it will all have to be worked and realigned, has stood up very well in view of its none-use and lack of maintenance for approximately 40 years.

The railroad traverses very rocky and mountainous country, thence running off on to flat gravel plains and through some very sandy terrain.

There are several places along the route where new culverts and/or bridges will have to be constructed due to the fact the culverts which were installed were not large enough to take care of the "flash flood " storms of the desert, and new openings were made by the shifting channels of water through the right-of-way. The entire line will have to be reworked, aligned, new ballast, etc., and 2,800,000 cubic yards of fill will also be necessary, as well as new rail, ties, track material, etc. The corrosion of the tracks, ie., rail, ties, clips, bolts, etc., was caused by a considerable amount of salt being in the sand which covered the tracks in a good many locations.

The station buildings, etc., are in good condition, particularly those located in Saudi Arabia. All of the buildings were constructed of native stone, however, they do need doors, windows and minor repairs to walls, roofs, ceilings etc. However, the station buildings in Jordan will have to be newly constructed, as well as several of the culverts and bridges because it is quite apparent that the Jordan end of line is where General Lawrence did most of the damage by blowing up practically everything in site along the line.

We were met in Ma'an by the Chief Inspector of the Jordan State Railways on the evening of February 6th and spent the night there in Petra Hotel. The next morning, February 7th, we left Ma'an via gasoline inspection car for Amam arriving there at 3.40 P.M., where we were met by the Under Secretary of the Ministry of Communications for Jordan, Director General of the Railroads and several others, with whom we discussed the high lights of our trip. The followi day, February 8th, we called on the Saudi Arabian Ambassador, USA Ambassdor, Under Secretary of the Ministry of Communications and Point IV officials for the purpose of discussing the trip.

It was very apparent from our conversations that all are very deeply concerned with this project and would like very much to have the railroad rehabilitated.

We left Amam via the same gasoline inspection car at 8.00 A.M. on February 9th and in Damascus at 1.00 P.M., where we were met by the Minister of Agriculture, who is also Manager of the Syrian State Railways, Deputy Minister of Communications and others of the Syrian Government. The remainder of the afternoon was used up in a general discussion of our trip. The following day we made officials calls on the Saudi Arabian Ambassador, USA Ambassador, Minister of Communications, Minister of Public Works, Director General of Transportation and also to the office of the President of Syria. At all the meetings the main subject of discussion was our trip across the desert and the condition of the railroad.

In between times we got back to our hotel and started in our report of the trip which was to be the subject of a meeting with the Manager of the Railroads on the afternoon of February 10th. On February 11th the report was further discussed and we were then invited to a luncheon at Club deOrient by the Minister of Public Works and his staff.

We left Damascus on February 11th via taxi at 3.15 P.M. for Beirut.

We found the same feeling in Damascus with respect to the rehabilitation of the railroad as we had found in Amam. Every one was desirous of having the line placed in operation.

In our report we placed the cost of rehabilitation at approximately 40,000,000 Syrian pounds, or in the neighborhood of $11,500,000 to $12,000,000, depending greatly upon the number of drainage structures it will be required to construct along the line.

I have given considerable thought to the rehabilitation of this railroad while on the trip and wish to make the following comment:

As you and every one else knows our Government's relations with the Arab world are not what you would call "real good". It has therefore occurred to me that in order to cement such relations, if at all possible, our Government might find a way by means of a grant or otherwise of assisting financially in the rehabilitation of the line. I am inclined to believe that such action would do us a wealth of good from a foreign policy standpoint, especially with Syria, Jordan and Saudi Arabia, as well as with the other members of Arab League.

Hejaz RR

USA OPERATIONS MISSION TO SAUDI ARABIA
American Embassy - Jidda

OFFICIAL - INFORMAL
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February 1, 1954

Dear Paul:

Several weeks ago Mr. Fred Zahid, Engineering Advisor to Prince Talal, Minister of Communications, called on us at the request of the Minister to discuss the proposed reopening of the Medina-Ma'an Railroad which, as you may recall, was largely destroyed by T. E. Lawrence during World War I. Mr. Zahid stated that the King is very much interested in this project and had instructed the Minister of Communications to study the matter and furnish him with a report on the findings.

Mr. Zahid stated that the Minister would like to know if USAOM/Jidda would have that railroad surveyed as was done for the Riyadh-Jidda proposed railroad, but using the same route as was formerly used. We replied to the effect that we considered the Minister's request as being in line with the objectives of this Mission but that since no provisions had been made in our budget for such work, the necessary funds to cover the survey would have to come from economic aid and that we would have to request authorization from FOA/W to divert the required funds from Road Planning and Surveys Project (Abha-Taif Road) for the Medina-Ma'an Railroad survey. Mr. Charles Buck of the International Engineering Company was here at the time and we asked him to give us an idea as to what the cost of such a survey would be. He came up with a figure of around $100,000.

In view of the possibility that the Minister of Communications will send us a formal request for such technical assistance, we shall appreciate your authorizing us at this time to accede to such request if and when received, on the basis of the necessary cost being deducted from the above-mentioned economic aid project funds.

We might also mention that several days ago the Minister of Communications informed us that Mr. Zahid, together with the Chief Engineer of the Saudi Government Railroad, was leaving for a preliminary survey of the route and condition of any equipment, buildings, etc. that might still exist. He also requested that Mr. Sinclair, Chief of our Transportation and Communications Division, accompany those gentlemen, to which request we, of course, acceded. The party left day before yesterday with Mr.

Mr. Paul F. Taggart,
Chief, Iraq, Saudi Arabia, Lebanon, Syria Division,
Near East, South Asia and Africa Operations,
Foreign Operations Administration,
Washington 25, D. C.

Charles Buck accompanying them, and are expected back here in about ten days.

We are also informed that an agreement has been reached by delegates from the three countries involved in this railroad; i.e. - Syria, Jordan and Saudi Arabia, at a recent meeting held at Riyadh pertaining to the reopening of this Hejaz Railway. Such agreement, of course, will be submitted to the Governments concerned for ratification.

We will keep you informed as to developments of interest in this connection.

Sincerely yours,

HJC

Harland J. Corson, Director
USA Operations Mission to Saudi Arabia

HJCorson:o

Hejaz R.R.

file

Jidda, January 28, 1954.

MEMORANDUM:

Equipment loaded in USOM Jeep No. 20 as of this date for trip Jidda to Medina, thence to follow the Hejaz Railroad route:

✓ 2 ~~3~~ Water jugs
1 Medicine box - nothing much left in it.
✓ 2 Pillows
✓ 6 Blankets
2 ~~3~~ Cots
2 ~~3~~ Bed rolls
1 ~~2~~ Spare tires and tubes.- one tire and tube destroyed on trip.

E. F. Sinclair.

OK

2/18/54

3 water jugs ✓
1 Medicine Box ✓
2 pillows ✓
3 Army cots – ✓
6 blankets – ✓
~~1 B-4 bag Personal clothing~~
3 sleeping bags. ✓
2 spare tires ✓

TRANSLATION

Ministry of Communications
Jedda, Saudi Arabia
January 7, 1954 (2/5/73)

Director,

Liaison Office for Technical Assistance.

Greetings,

It has been found necessary to ask Dr. Brown or his assistant, Mr. Bogue, to accompany the Hejaz Railway Surveying Mission to determine the location of wells to be drilled along the railway line.

I wish you would contact the Director of the U.S.O.M. to arrange for the travel of either of the aforesaid with the Mission on Saturday.

Deputy Ministry of Communications

/s/ Abdul Aziz Bin Mua'mmar

Sa/A

Mr. Corson's attention

Fuad Najjar

T & C Division

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LIST OF AUTOMATIC ELECTRIC COMPANY TELEPHONE EXCHANGES IN OPERATION IN SAUDI ARABIA.

SAUDI ARABIAN GOVERNMENT RAILWAY

Dammam	100 lines

ARABIAN AMERICAN OIL COMPANY (ARAMCO)

Dharan Main Exchange (on order)	2.000 lines
" " " present	1.000 "
Ras Tanura	400 "
Abqaiq	400 "
Dharan 1 PAX	100 "
" 2 "	50 "
" 3 "	22 "
" 4 "	22 "
Ras Tanura 1 PAX	50 "
Abqaiq 1 CAX	40 "
Jeddah 1 PAX	50 "
Nariya 1 PAX	100 "

UNITED STATES GOVERNMENT

U.S. Embassy - Jeddah	50 "
U.S. Consulate General-Dharan	50 "

UNITED STATES AIR FORCE

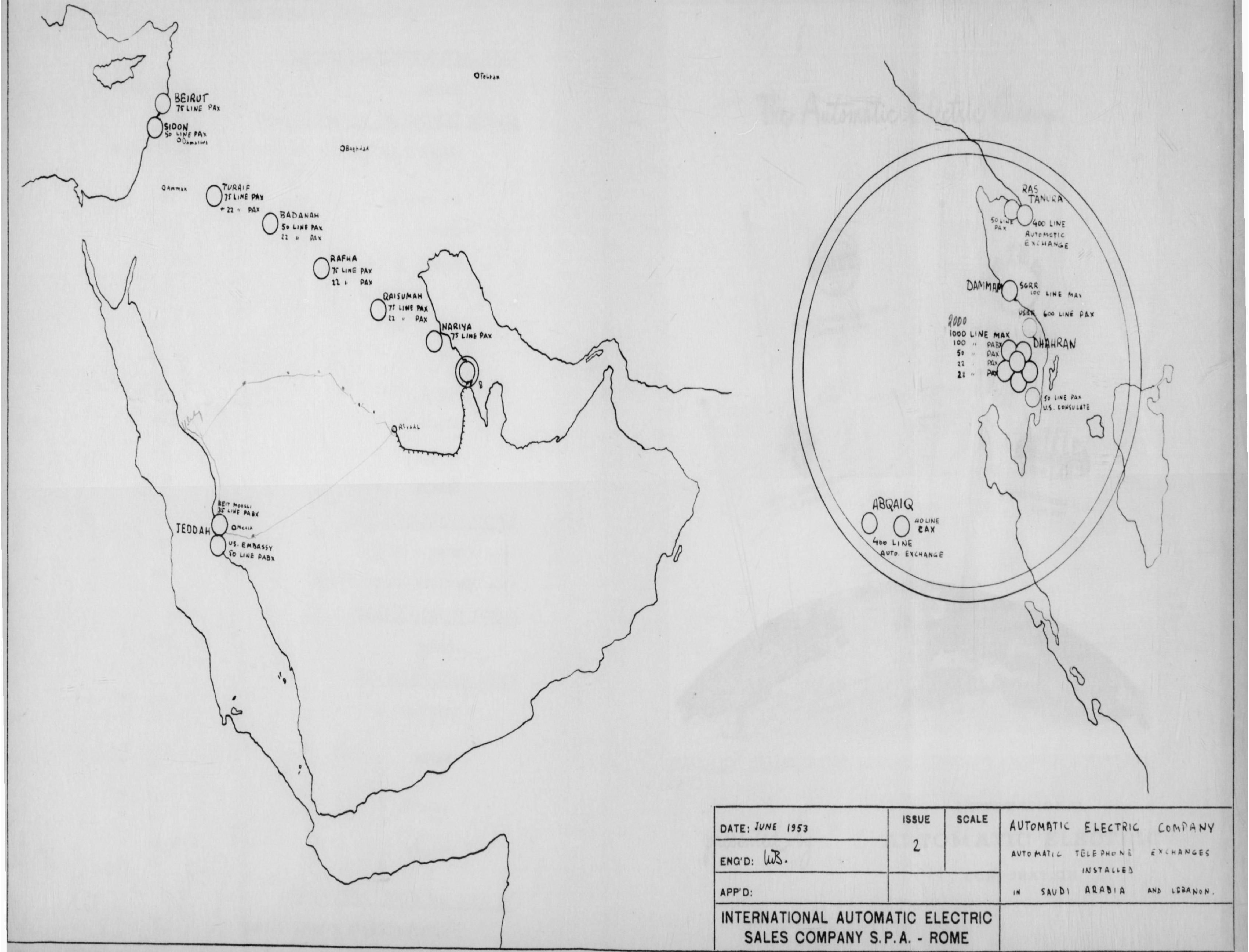
Dharan	600 "

TRANS ARABIAN PIPE LINE

Qaisumah 1	100 "
" 2	22 "
Rafha 1	100 "
" 2	22 "
Badanah 1	50 "
" 2	22 "
Turaif 1	100 "
" 2	22 "

ON ORDER and UNDER INSTALLATION

H.M.The King's Palace Riyadh	50 "
» » » »	22 "



DATE: JUNE 1953	ISSUE	SCALE	AUTOMATIC ELECTRIC COMPANY
ENG'D: WB.	2		AUTOMATIC TELEPHONE EXCHANGES INSTALLED IN SAUDI ARABIA AND LEBANON.
APP'D:			

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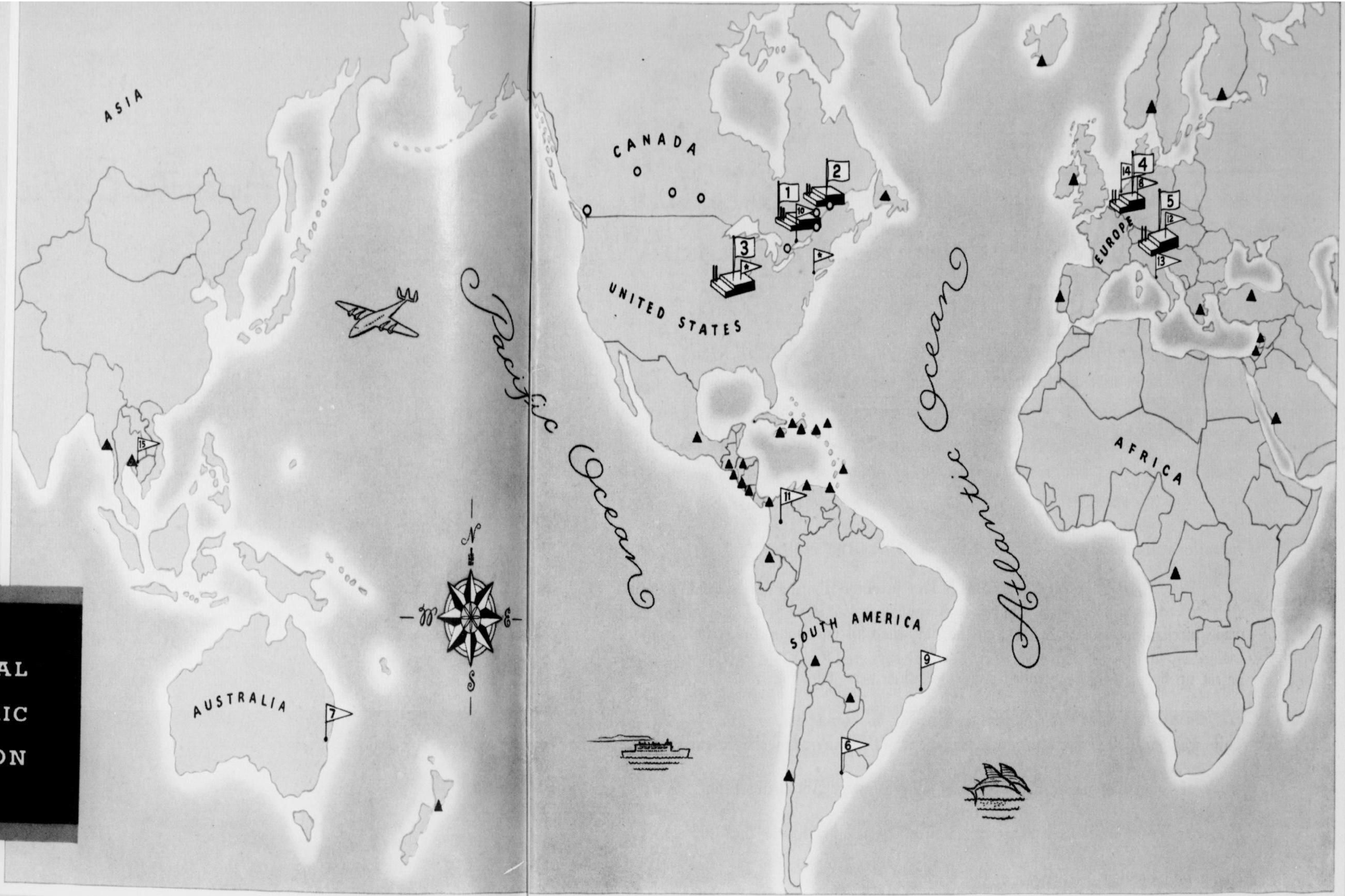

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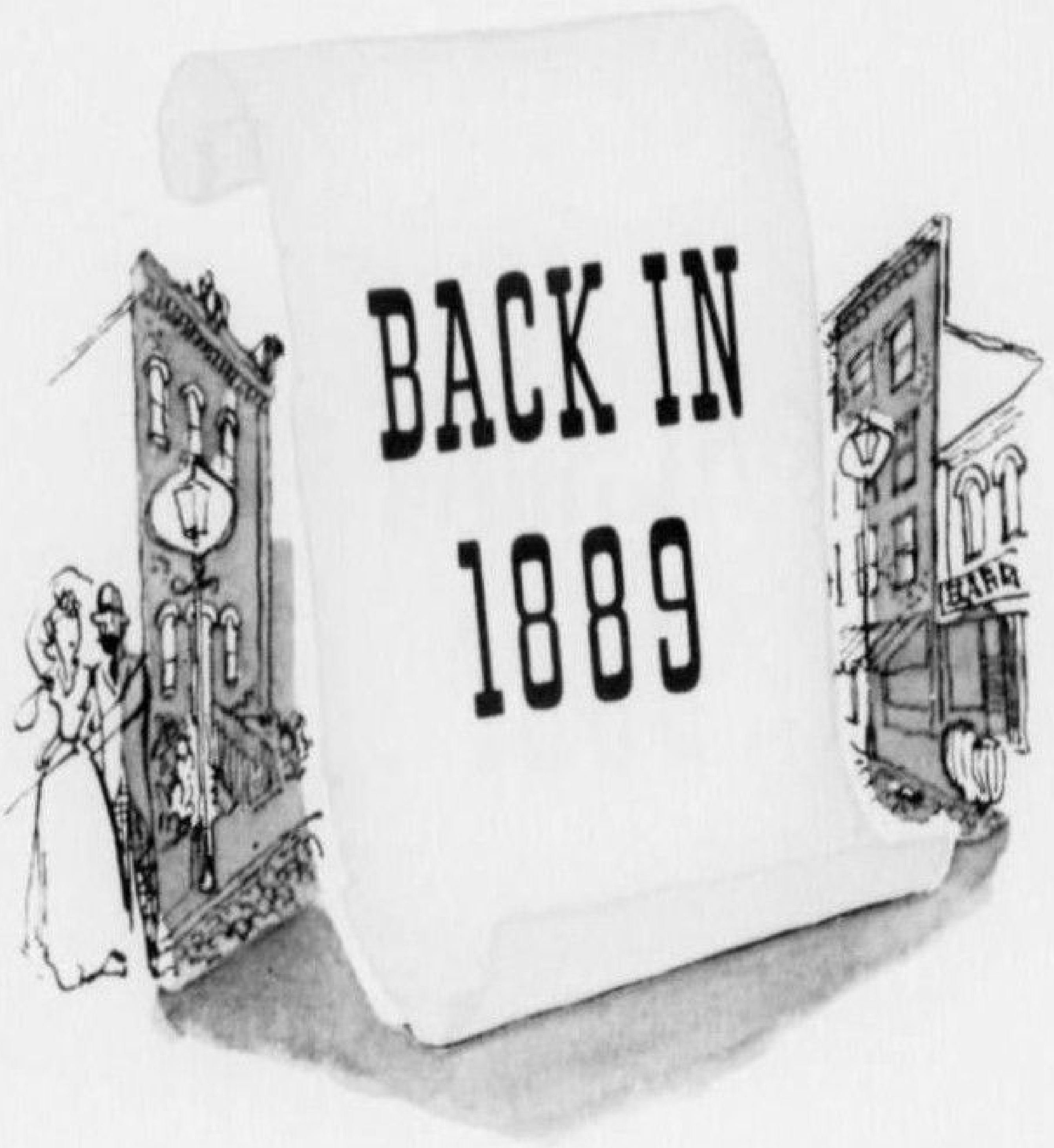

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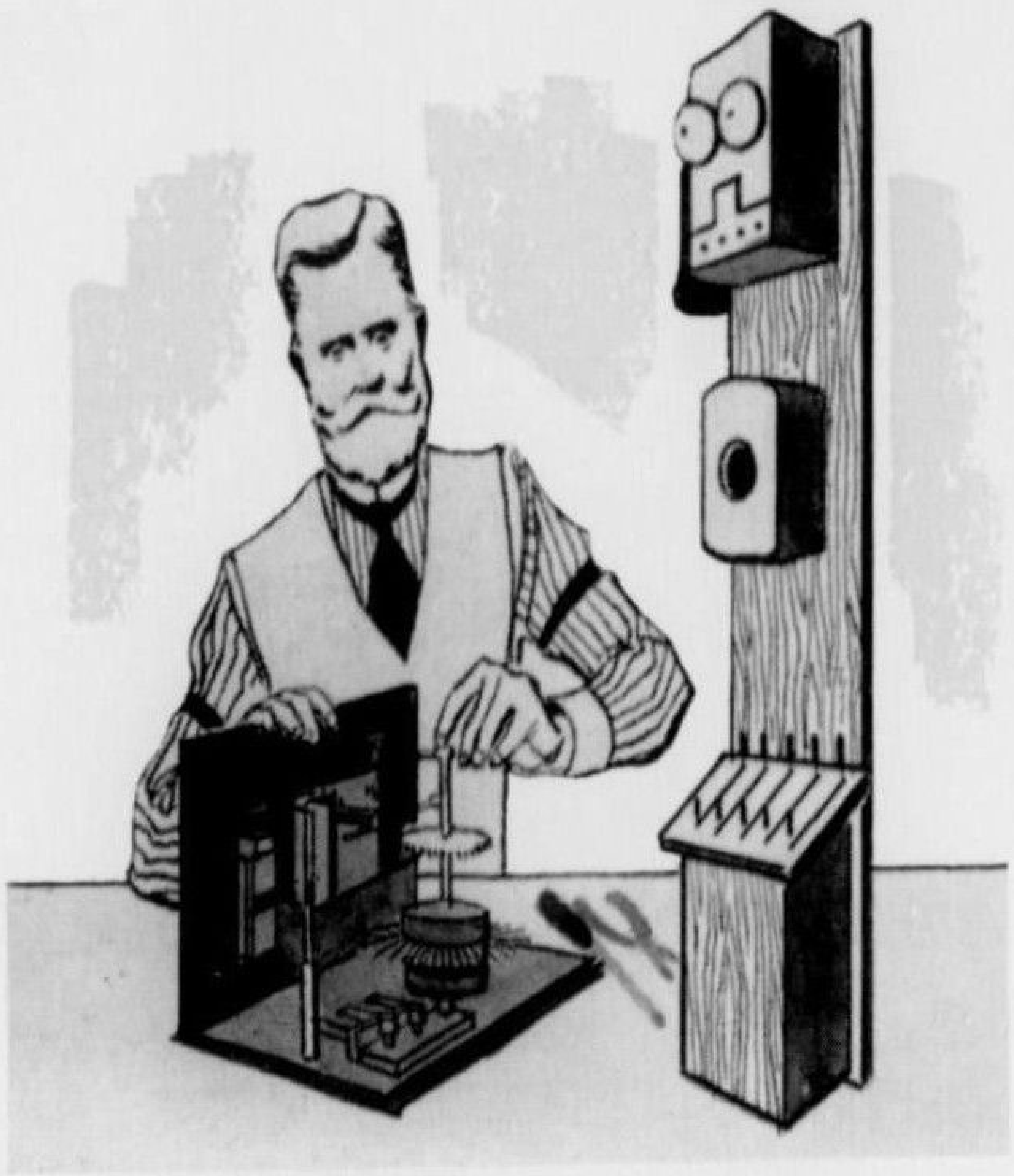
THE AUTOMATIC ELECTRIC GROUP is staffed by research scientists, equipment designers, production experts, and installation technicians, whose work is guided by experience extending back to the first practical automatic telephone system.

THE AUTOMATIC ELECTRIC GROUP maintains close liaison with its customers through trained and experienced field consultants throughout the world. Having long familiarity with the adaptation of Strowger Automatic equipment to particular requirements, they are readily available for personal consultation with operating and administrative officials in the areas they serve.

THE AUTOMATIC ELECTRIC GROUP is strong and stable financially, with resources to attract and retain the best in personnel, to keep its production facilities abreast of technological advances, and to finance long range development programs.

THE AUTOMATIC ELECTRIC GROUP has at its disposal the resources of Associated Telephone and Telegraph Company, of Wilmington, Delaware, and Theodore Gary and Company, of Kansas City, Missouri. These companies have from time to time furnished the Group with financial support important to Group operations.

THE AUTOMATIC ELECTRIC GROUP is truly international in scope, with ample facilities for gathering, storing, and making available experience drawn from all parts of the world. Its uninterrupted career of designing, building, and installing automatic telephone systems under varied conditions has resulted in that accumulation of knowledge and skills which assures equipment having the highest standards of service, dependability and long life.



Strowger's switch of 1889, on which the first automatic telephone patent was obtained, used an up-and-around, magnet-driven stepping mechanism. It was the prototype of most of the automatic switches in use today.

A NEW IDEA FOR A NEW ERA

During the last decade of the 19th century, "Strowger Automatic" challenged the telephone world with a new idea. Since then that idea has dominated telephone thinking, and has set the pattern for all subsequent development in that field.

In 1889, Almon B. Strowger, of Kansas City, Missouri, U.S.A., annoyed by the defects of manual telephone service, decided to eliminate the switchboard operator by putting a machine in her place. A daring and persistent dreamer, but endowed with above average common sense and native ingenuity, Strowger envisaged a step-by-step, up-and-around line switching mechanism moved by pawls and electro-magnets controlled by electrical impulses sent from the calling telephone. Using such crude materials as he could find and hampered by lack of mechanical skill, he nevertheless succeeded in constructing a model which operated and upon which he obtained the first patent on an automatic telephone exchange.

The neat, compact, sturdy and reliable Strowger switch of today bears little resemblance to the original model, but the step-by-step, up-and-around principle, though challenged from time to time, still stands supreme. Today approximately 75% of all automatic telephones in the world are served by equipment which uses this principle.

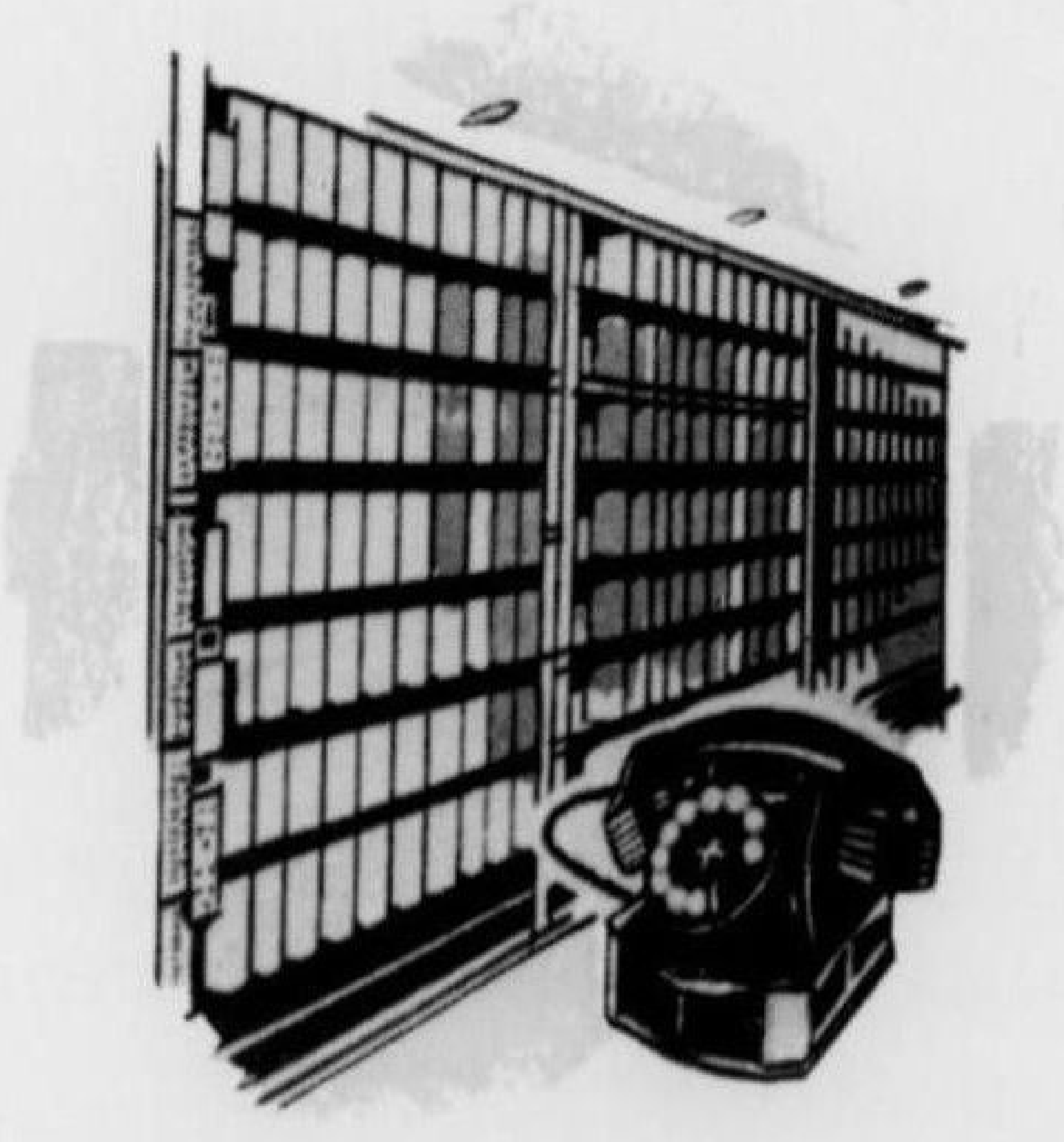
It was a long and arduous road from Strowger's basic idea to the world's first automatic telephone exchange which, in 1892, began to render service to a few subscribers in LaPorte, Indiana, U.S.A.—not far from the city of Chicago where the Automatic Electric organization had set up its plant.

Small and crude as it was, the success of that first installation was immediate. It answered with a decisive "Yes" the two vital questions: Would it work? Would the public like it?

Encouraged by these assurances Automatic Electric engineers drove ahead to refine and perfect the equipment, a process that has never ceased. The first essential was to meet the conditions of telephone service as then known, to do all that manual switchboards could do, and to do it faster, more accurately, and more economically. In the pursuit of this program, the LaPorte installation was followed by scores of other Strowger Automatic exchanges throughout the United States. As a result of this early experience, a basic design was evolved which, while remaining unchanged in principle, has proved so sound and so flexible in application that it has met the most exacting tests of service and economy.

As the demand for telephone service continued to grow and the operating requirements became more complex, the Automatic Electric engineers systematically attacked the problems of adapting basic Strowger Automatic principles to new and more complex conditions. New service standards hitherto thought impossible were achieved and maintained; the equipment itself took on added refinement and mechanical harmony; its economy and its flexibility in meeting new and unforeseen requirements became a forceful and growing challenge to existing ideas. Thus, within a few years after the installation of the first automatic exchange—and while others were still debating its practicality—Automatic Electric engineers had arrived at a solution of the basic problems of automatic telephony.

The modern Strowger Automatic exchange retains the proved principles of the up-and-around mechanism originated by Strowger, and offers also the flexibility afforded by small unit design.



THE INTERNATIONAL AUTOMATIC ELECTRIC GROUP

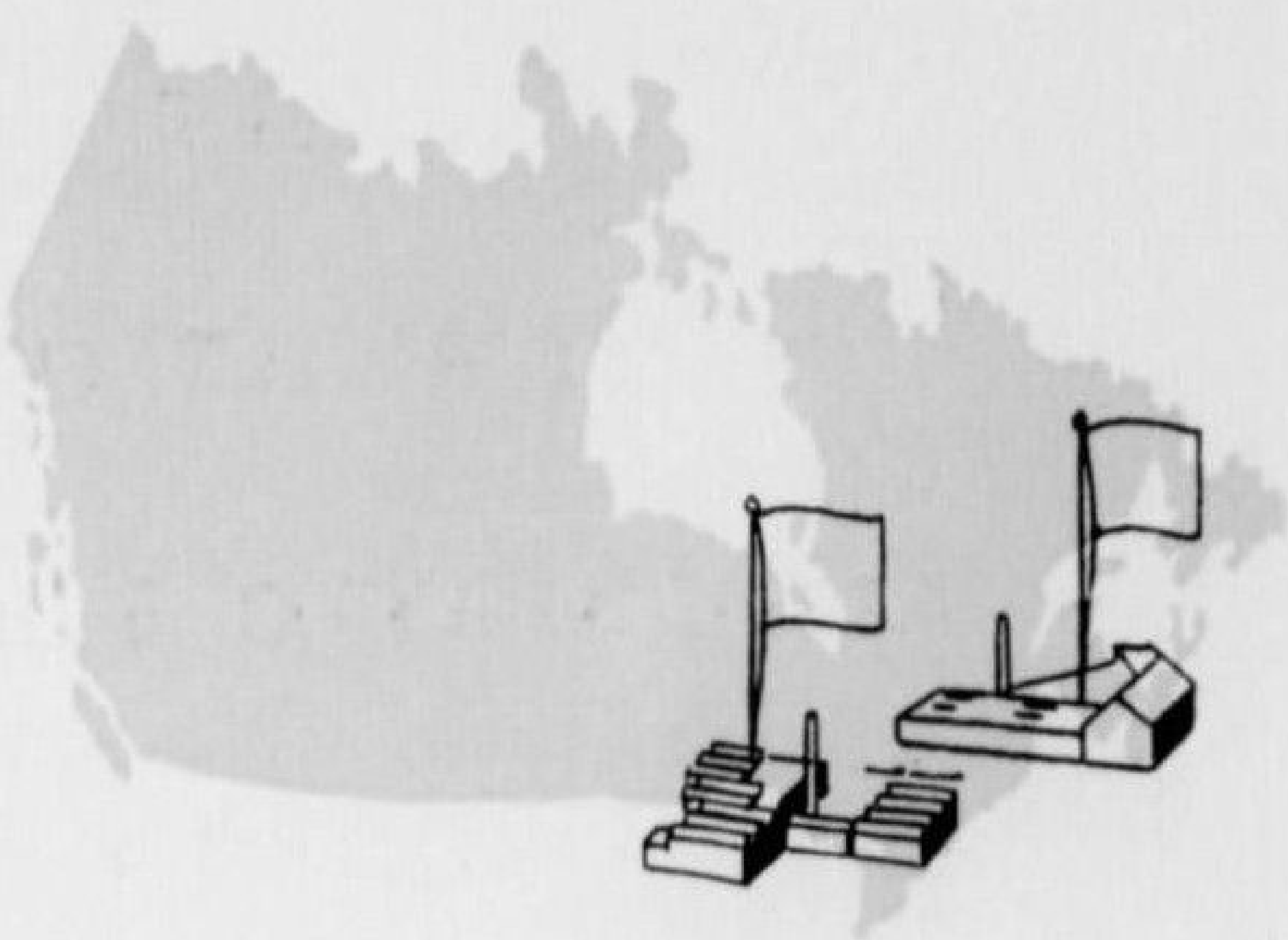
TO MEET the needs of the many telephone operating organizations throughout the world, the Automatic Electric Group has, through the years, built up a complete and balanced organization, comprising engineering, manufacturing, distributing and service companies on a scale commensurate with the international aspects of world telephone development.

This has been the result of no hasty throwing together of facilities and personnel; rather it has been a steady and organic growth, each step carefully considered and designed to meet efficiently and completely definite present or clearly foreseeable future requirements. This development, in all its parts and aspects, has aimed undeviatingly at a single purpose: to design and produce the most efficient, reliable and economical telephone equipment the mind of man can conceive, to adapt it to the specific needs of each locality where it is to be used, and to make it economically available to telephone administrations anywhere in the world.

To facilitate the great and growing world-wide demand for Strowger Automatic Telephone Equipment there has been established under the guidance of the parent Automatic Electric organization in Chicago, a group of affiliated manufacturing enterprises with plants in Canada, Belgium and Italy; and a corollary group of advisory, service, and distributing companies, comprising collectively the International Automatic Electric Group, with trained and experienced personnel and technical facilities at key cities in the principal countries throughout the world.

All of these companies have access to, and contribute to, the great pool of technical knowledge and experience which has been accumulating since the early nineties. These combined resources—gathered, organized, and made available to all units alike—represent an impressive aggregation of technical knowledge and practical experience covering the field of telecommunications techniques with particular emphasis on the field of automatic switching. Together, this knowledge and experience are helping to direct the thinking of telephone men everywhere in channels that are recognized today as the soundest and most progressive in the industry.

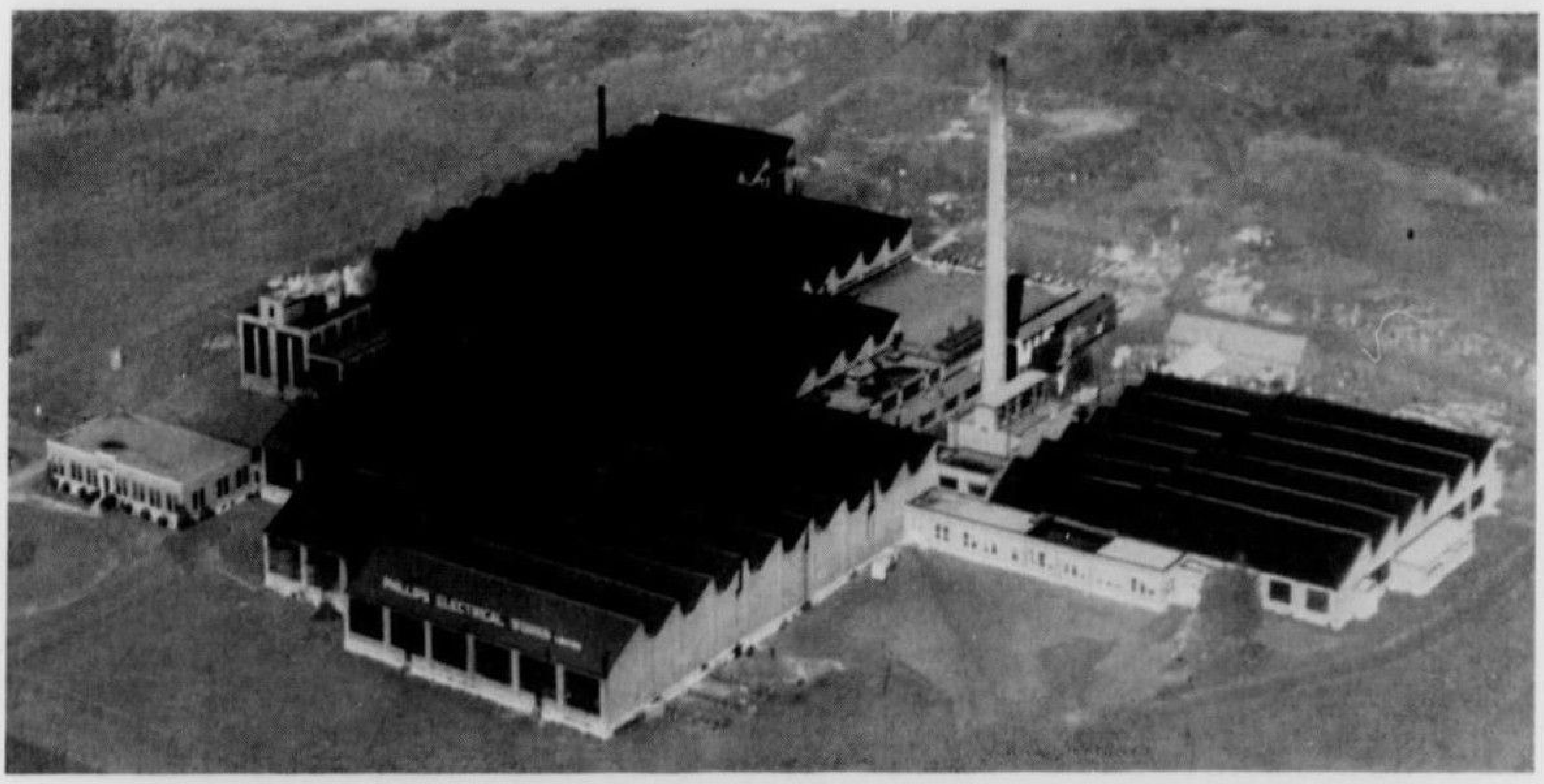
PHILLIPS ELECTRICAL WORKS LIMITED



PHILLIPS ELECTRICAL WORKS LIMITED is the Canadian manufacturing affiliate of Automatic Electric, with factories in Brockville, Ontario, and Montreal, Quebec. For many years devoted exclusively to the manufacture of wire and cable for the communications, power, manufacturing, and transportation industries, Phillips today is also an important producer of Strowger Automatic Telephone Equipment, telephone instruments, and other related telecommunications apparatus.

The original Phillips plant, established in Montreal in 1889, was the first organization to be set up in Canada for the production and processing of wires and cables, and was established particularly to supply the wire and cable needs of Canada's rapidly expanding telephone and telegraph facilities. A much larger plant was built in what is now the northeastern part of Montreal and placed in operation in 1905.

Canada's vast water power resources have led to a tremendous development in the generation, transmission and utilization of electricity. The large demand for specially designed wires and cables was met by the Phillips organization with the manufacture of paper insulated power cables, armored cables and subsequently of flexible conduit, loom, and various types of industrial and building wires and cables.



The Brockville, Ontario, plant of Phillips Electrical Works Limited, shown here, includes a copper rod rolling mill, wire and cable manufacturing departments, and facilities for manufacture of Strowger Automatic telephone equipment and other telephone apparatus.

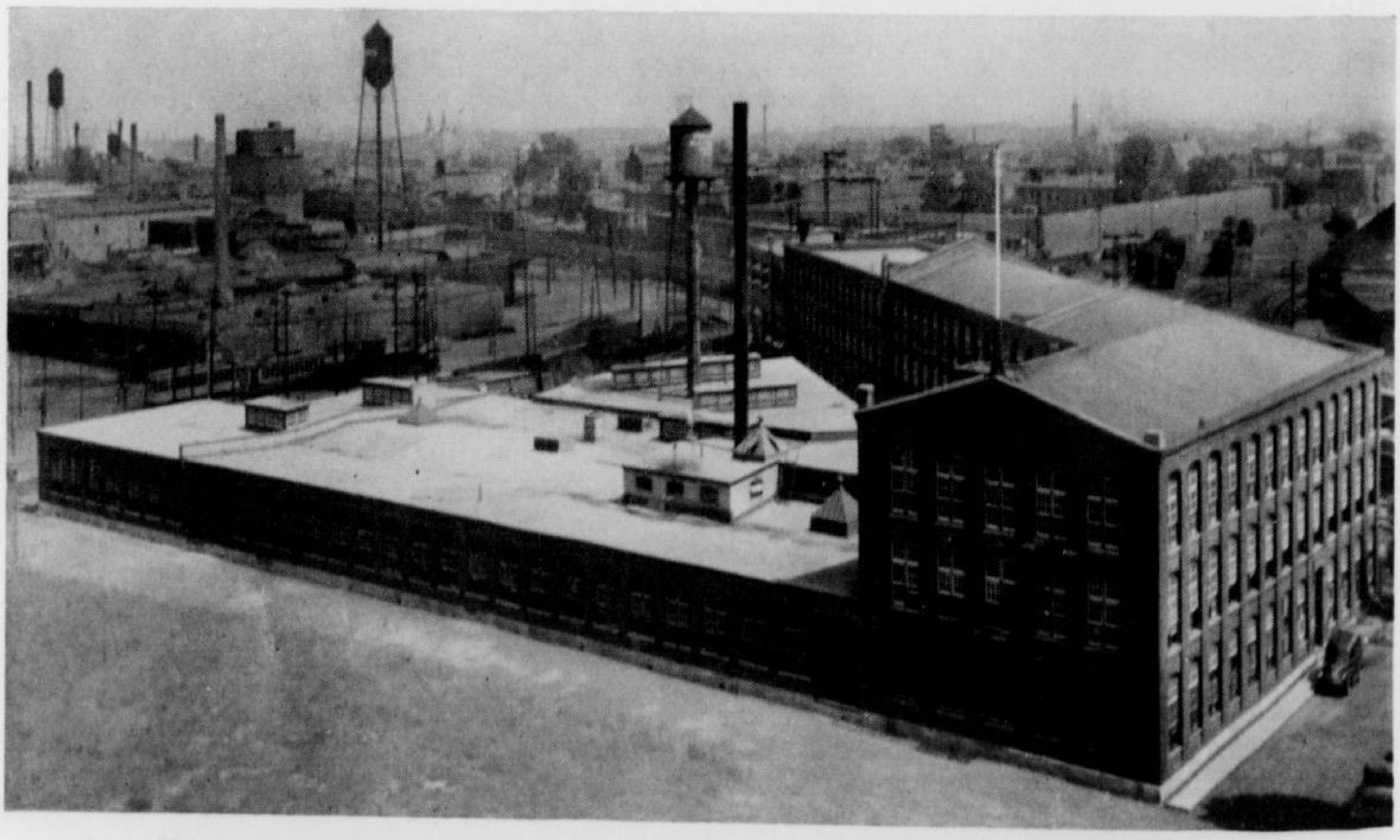
As a result of this growing demand a new and larger factory was built at Brockville, Ontario, in 1922. These facilities included the first Canadian copper rod rolling mill. Subsequently a modern wire and cable plant was built and integrated with the rolling mill, so as to effect maximum efficiency in handling all processes from the refinery copper wire bars to the finished product.

The existing factory at Montreal was retained for the somewhat special processes involved in the manufacture of power and communication cables, and the manufacture of all other products was transferred to Brockville, where the administrative and engineering offices are also situated.

The Phillips organization is capable of designing and manufacturing practically every variety of electrical conductor required by telephone, telegraph, radio and other communications industries, and by electrical, manufacturing, power and transportation organizations.

Subsequent to its acquisition by the Automatic Electric group, in 1928, Phillips entered into the manufacture of telephone equipment at Brockville. The Company now produces a wide variety of telephones, telephone dials, relays, and a complete range of Strowger Automatic switchboards and accessory equipment.

Sales and distribution of Phillips products in Canada are handled by an associated company, Automatic Electric (Canada), Limited, with head offices and main warehouse in Toronto, and with branch offices, warehouses, and agents at other points to afford complete service to its growing list of customers in the Dominion. Outside of Canada, Phillips products are distributed by International Automatic Electric Corporation, Chicago, and its affiliated companies and agents throughout the world.

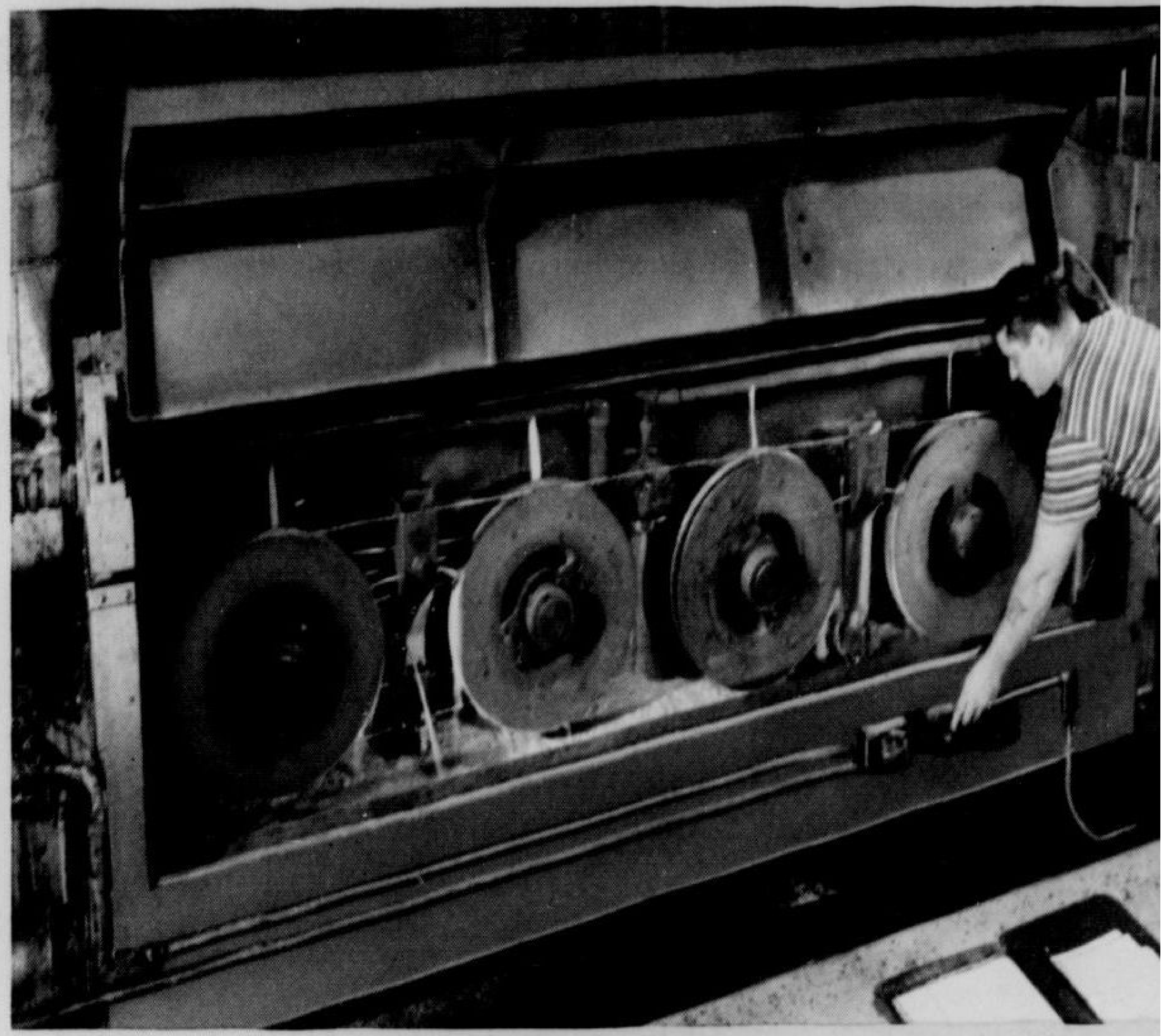


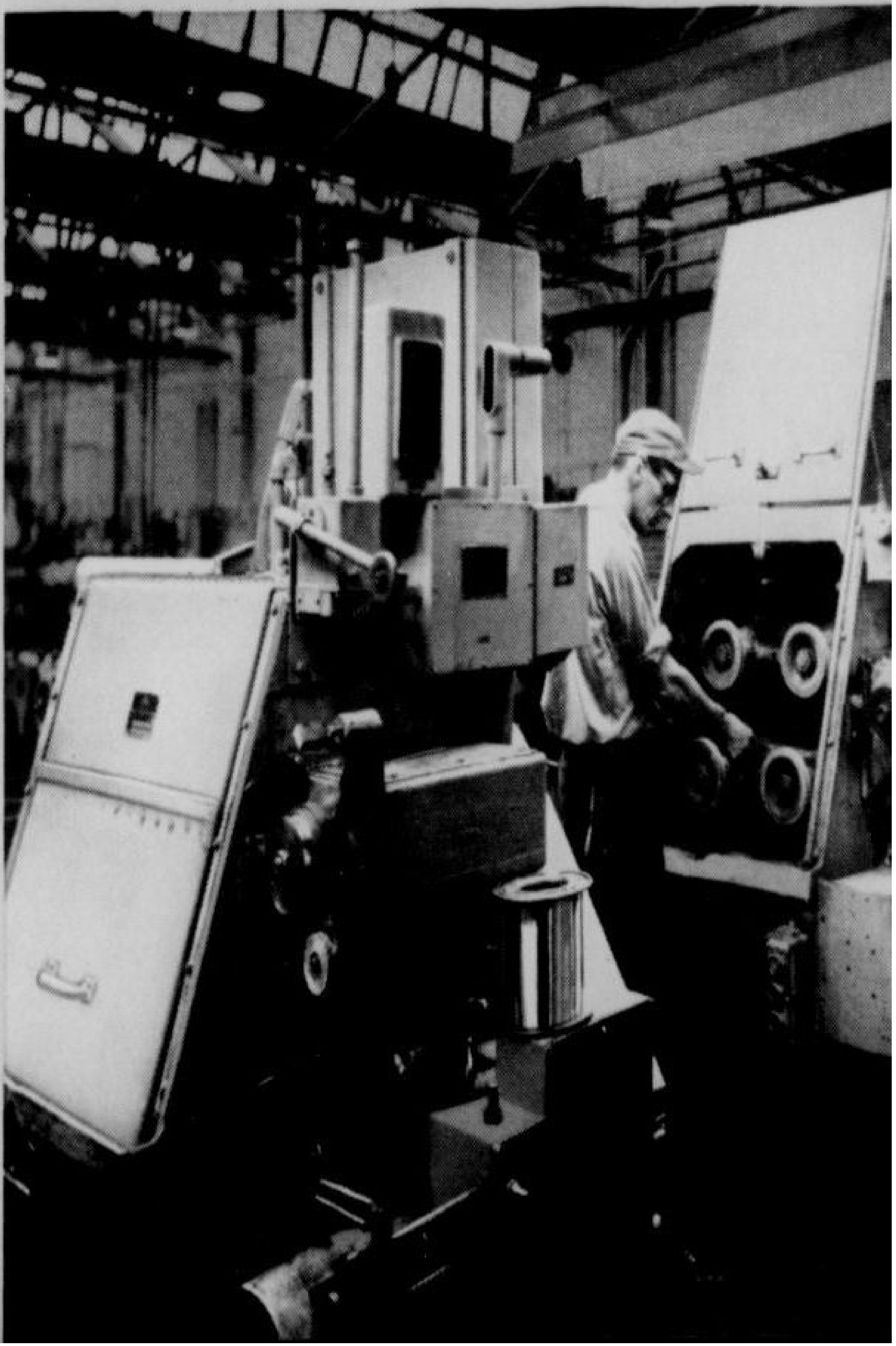
The Montreal, Quebec, plant of Phillips Electrical Works Limited is devoted to the special processes involved in the manufacture of power and communication cables.

From Copper Bar to Wire and Cable

PHILLIPS, the first manufacturers of wires and cable in Canada, produce a complete range of electrical conductors for power and communication, from refinery copper bars to the finished product in a multitude of types and sizes. The photographs on this and the next two pages show only a few highlights of the many processes carried out in the Phillips factories.

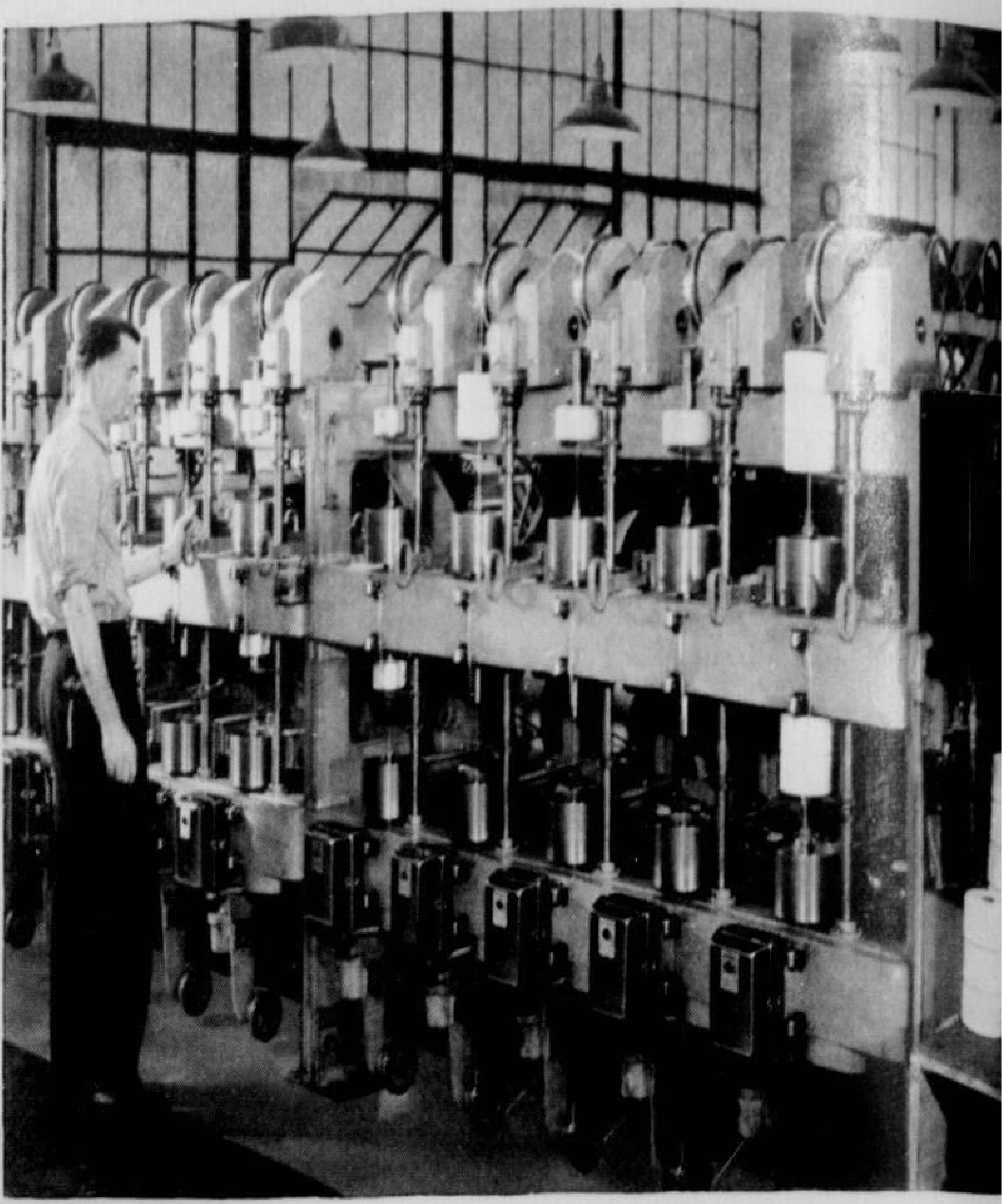
Copper is r
refined bar
hot rolling



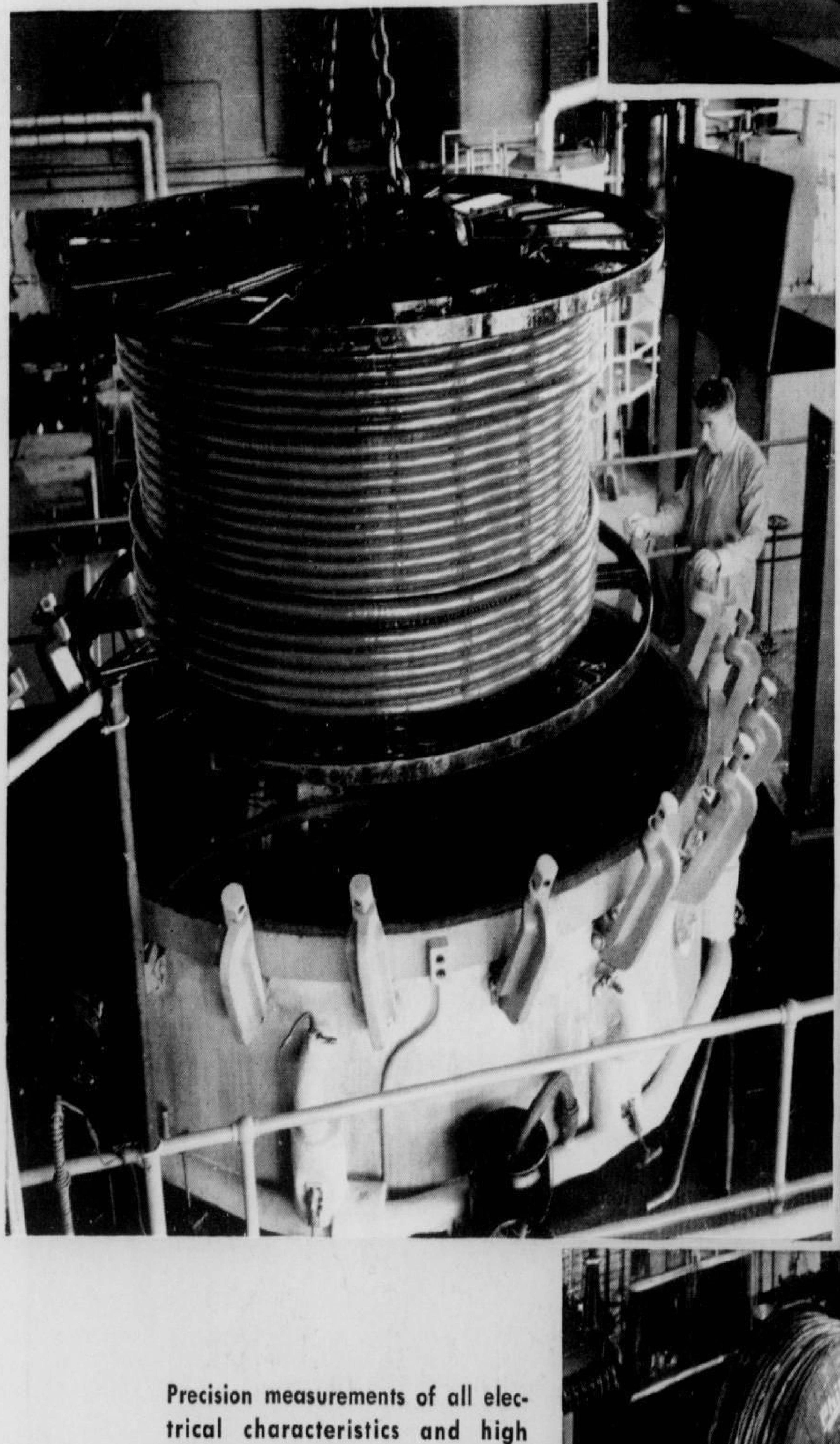


Wire drawing machines, with as many as 18 diamond dies, are used to reduce copper wire to the smaller sizes.

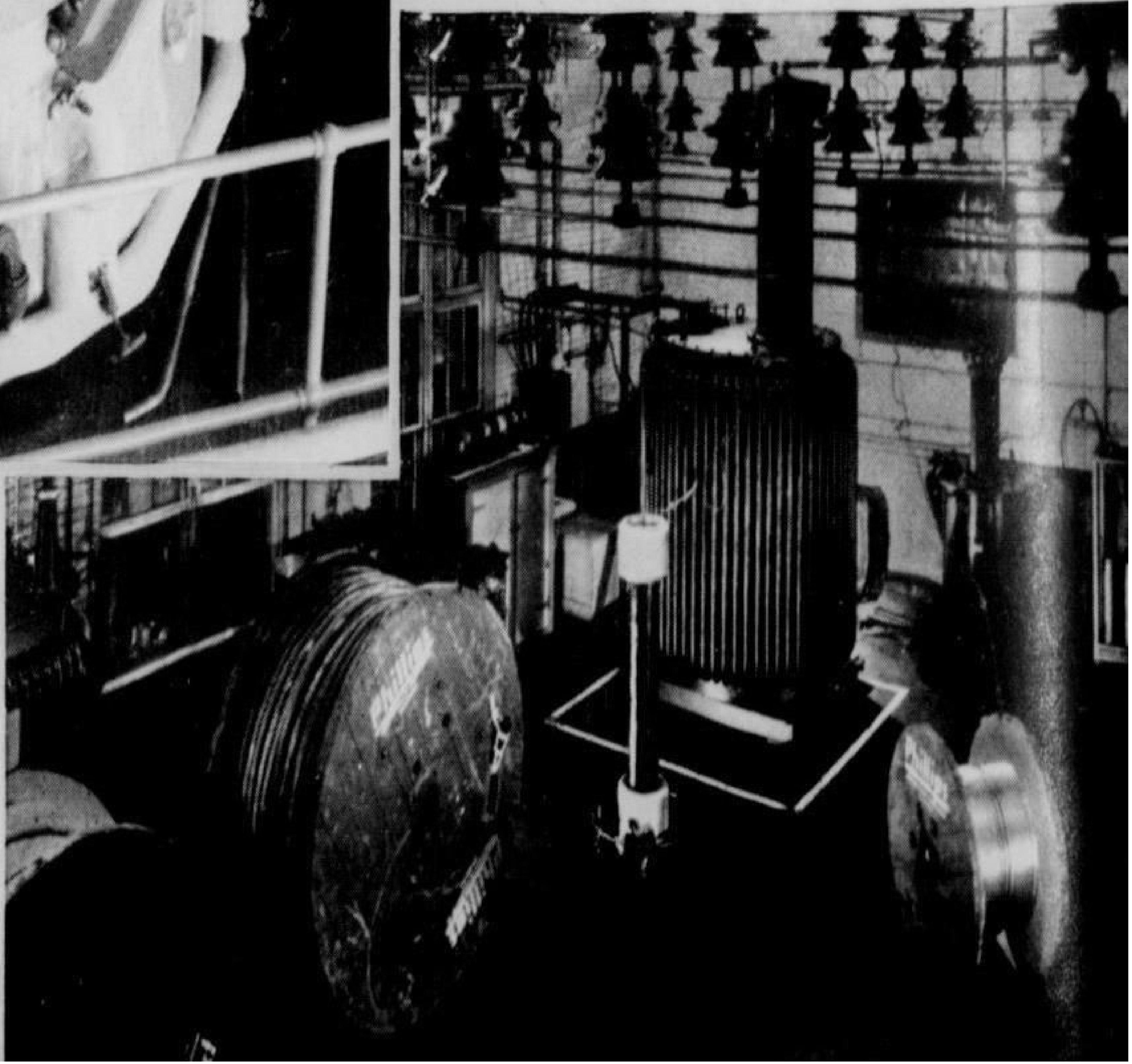
asbestos, on high-speed insulating machines.



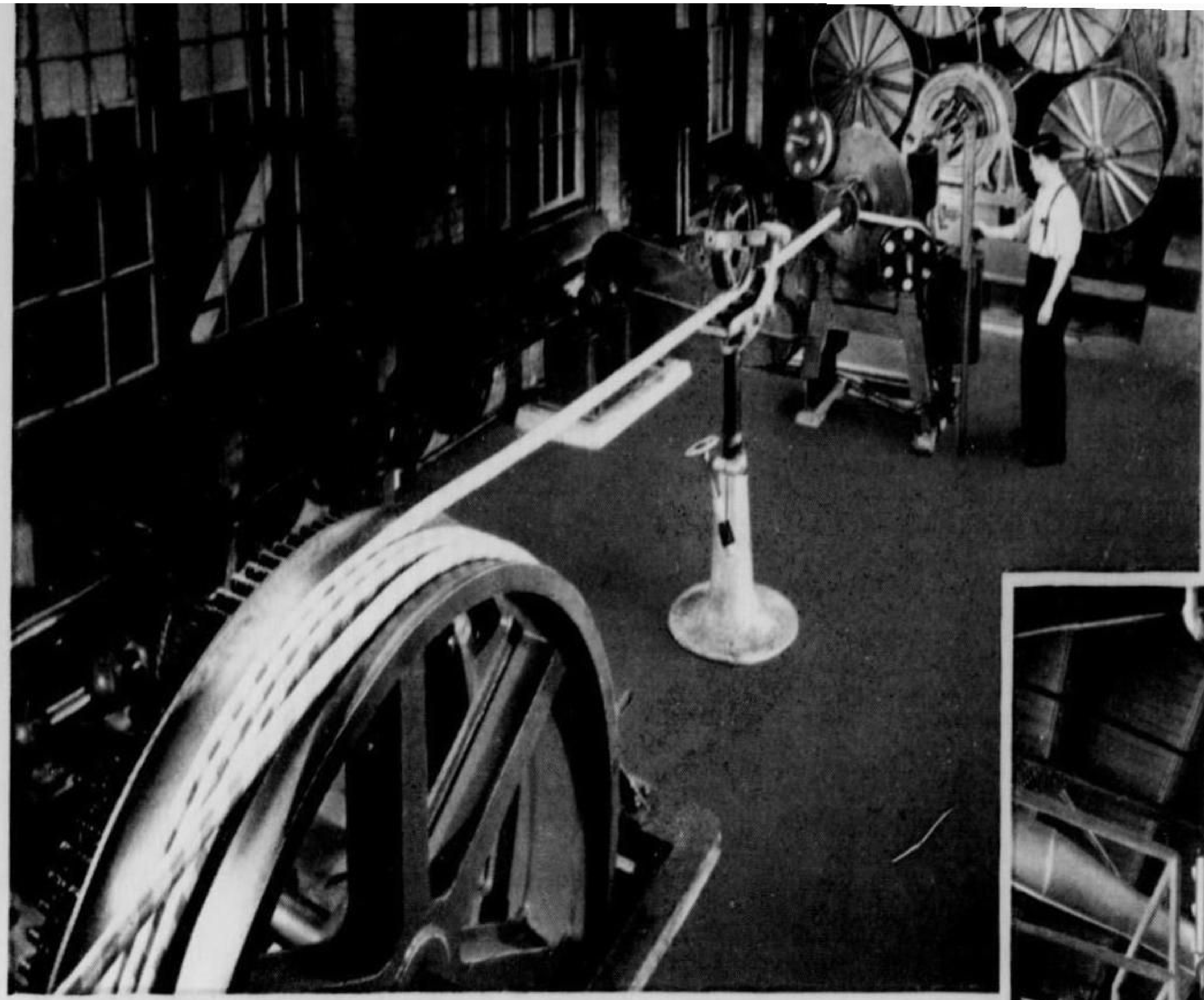
Finished conductors are subjected to exhaustive tests to insure compliance with specifications. Here magnet wire is being tested for continuity and dielectric strength of Insulation.



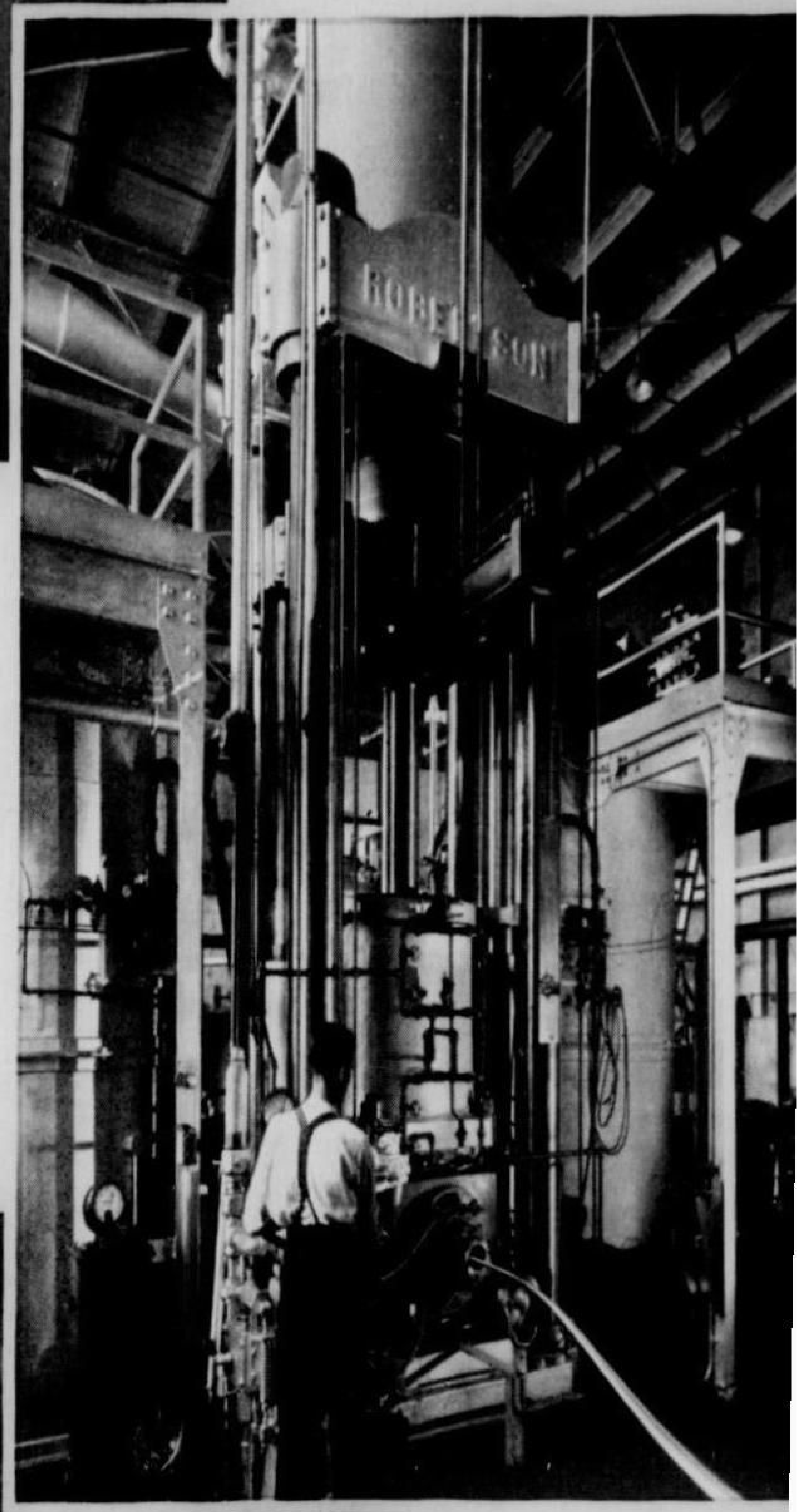
The manufacture of high voltage power cables demands the most exacting care in every process. This shows a length of paper-insulated cable after being impregnated under pressure.



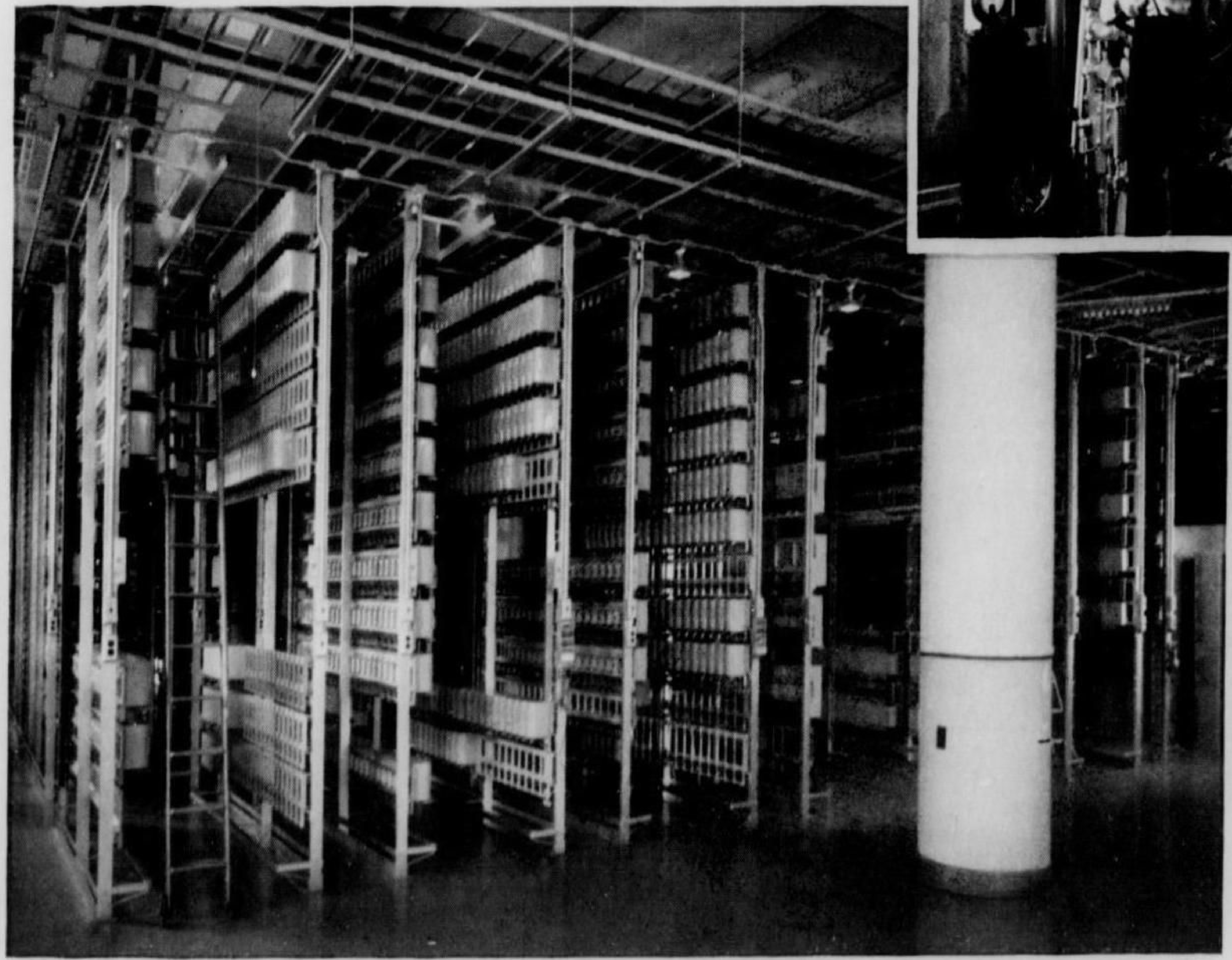
Precision measurements of all electrical characteristics and high voltage tests are made with the equipment shown at the right on every length of Phillips power cable.



Telephone cables are composed of hundreds of pairs of paper-insulated conductors. The twisted pairs are assembled into units of 101 pairs each, and the units stranded together to form the complete cable.

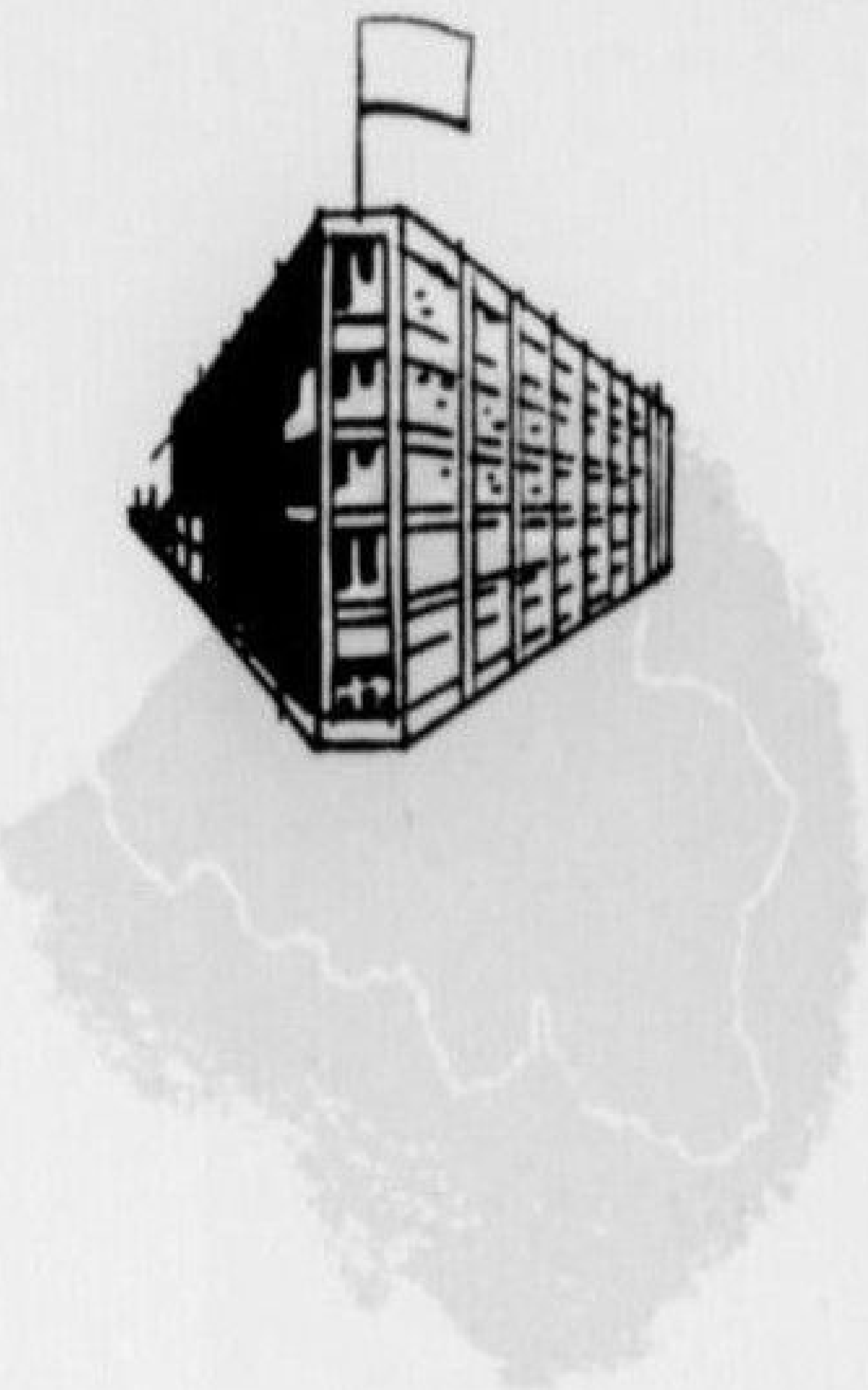


Paper-insulated telephone cables are protected from moisture by a continuous lead sheath, which is extruded around the cable by an hydraulically operated press.



Phillips Electrical Works Limited is the manufacturer in Canada of Strowger Automatic Telephone Equipment. This shows one of the central office units at Vancouver, B. C., made by Phillips for the British Columbia Telephone Company.

AUTOMATIQUE ELECTRIQUE, S.A.



Automatique Electrique, S.A., Antwerp, Belgium, known originally as Ateliers de Téléphonie et d'Electricité d'Anvers, was founded in 1892, and is therefore one of the oldest telephone manufacturing companies in Europe.

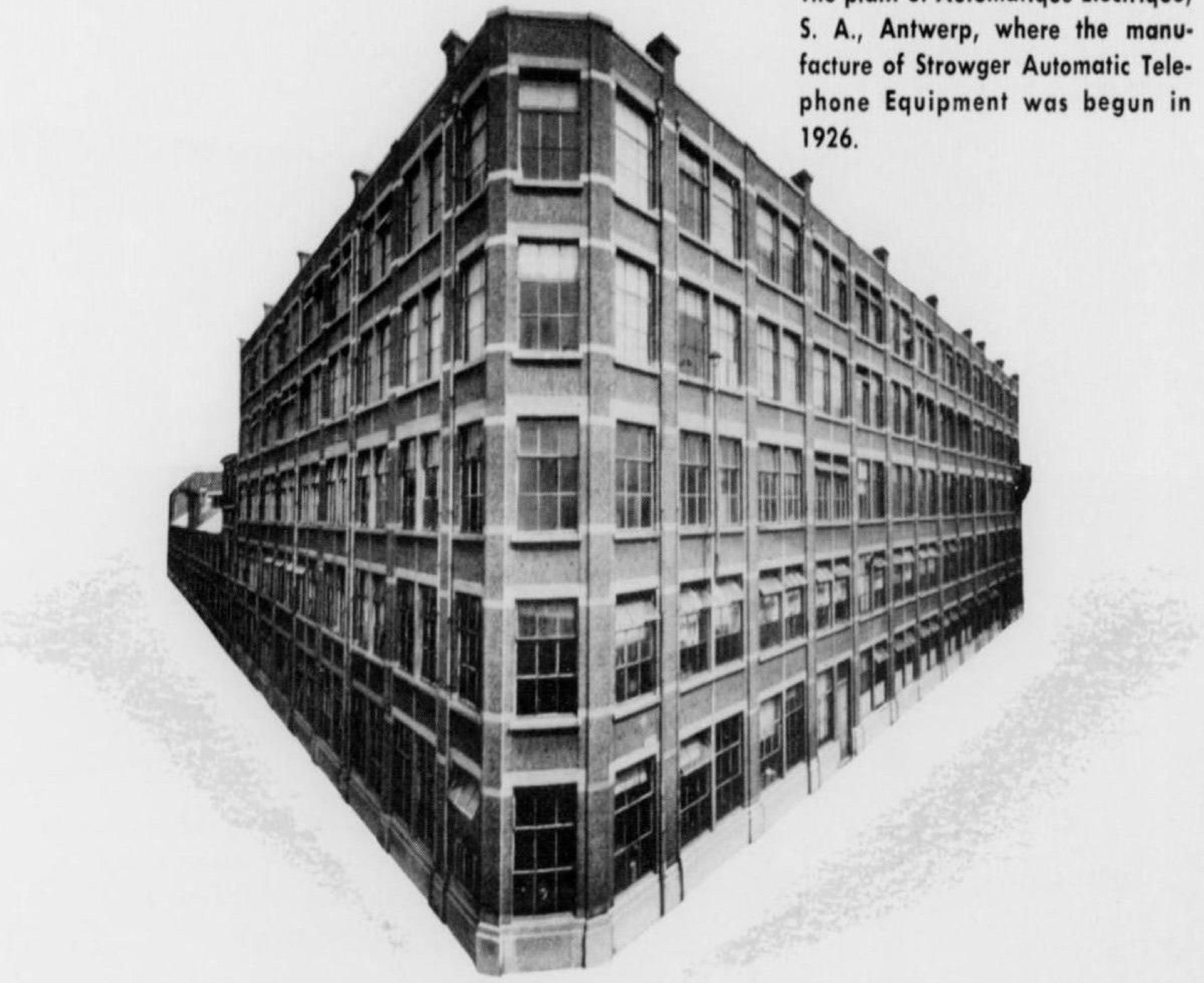
From its inception, the Company played a prominent part in the development of the telephone industry, and the present century was not far advanced when apparatus bearing the famous "ATEA" trade mark could be found in operation throughout Europe and Asia. Under the name of the The New Antwerp Telephone and Electrical Works, ATEA in 1926 became, as it is today, an important and integral part of the Automatic Electric group.

Now, as Automatique Electrique, S. A., with its extensive buildings, modern manufacturing facilities and well-equipped laboratories, and sharing the highly advanced techniques and research achievements of the entire group, the company manufactures a complete range of Strowger Automatic and manual telephone equipment—central office and sub-station—for public, private, marine and defense purposes.

The Belgian Parliament Buildings at Brussels are served by ATEA Private Automatic Exchange equipment.

As an important supplier of telephone equipment for the Belgian Telephone Administration, ATEA has an impressive list of Strowger Automatic telephone exchanges now functioning or under construction in Belgium. Important networks in this category are those centering in Tournai, Mons, La Louvière, Tongres, and Hornu.

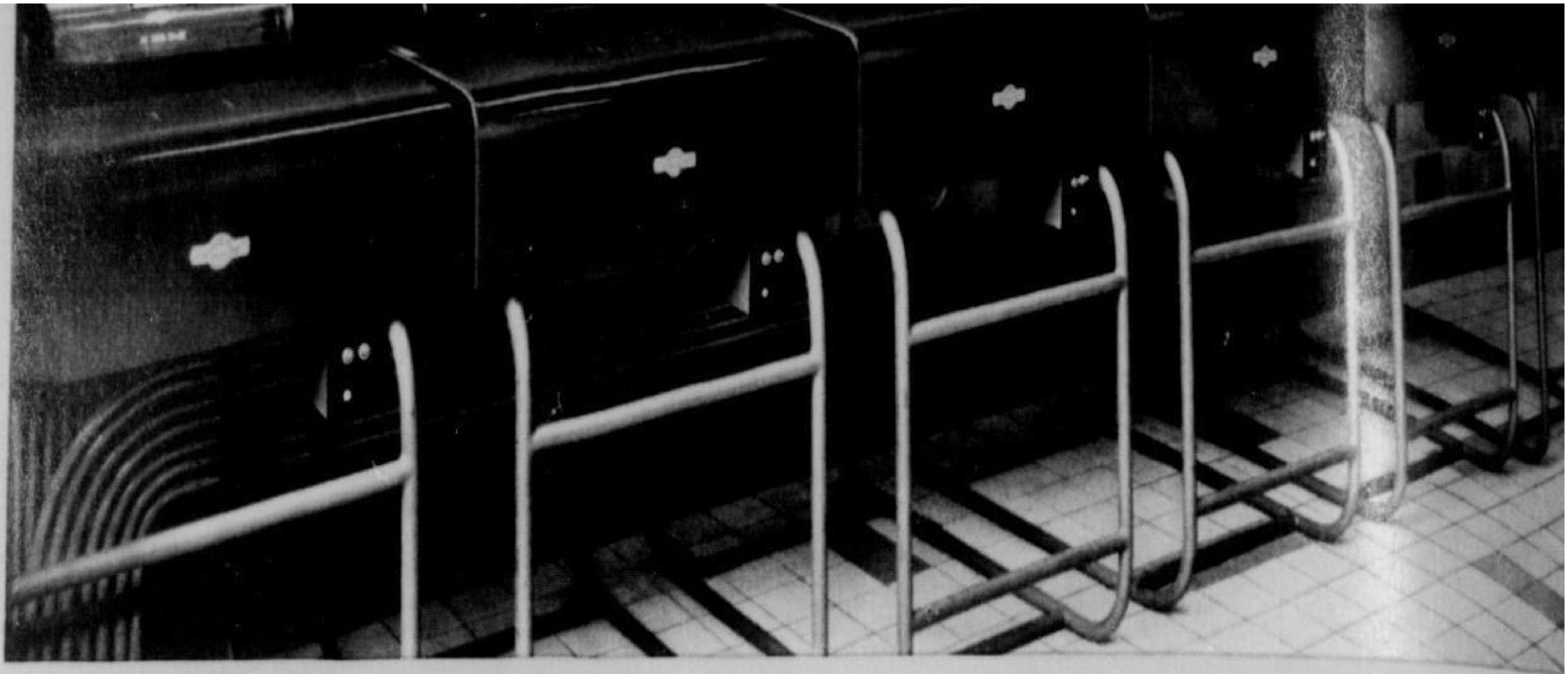
Another important project, entrusted to ATEA by the Belgian State Railway administration, is the task of modernizing the nation-wide railway telecommunication network. By 1950 this work was well advanced and when completed will provide the Belgian Railways with a private network as technically advanced as any in the world. Automatique Electrique, S. A., is also a principal manufacturer of electrical measuring and recording apparatus, and is one of the well-known European producers of watt-hour meters, monophase and multiphase, for household and industrial purposes.



The plant of Automatique Electrique, S. A., Antwerp, where the manufacture of Strowger Automatic Telephone Equipment was begun in 1926.

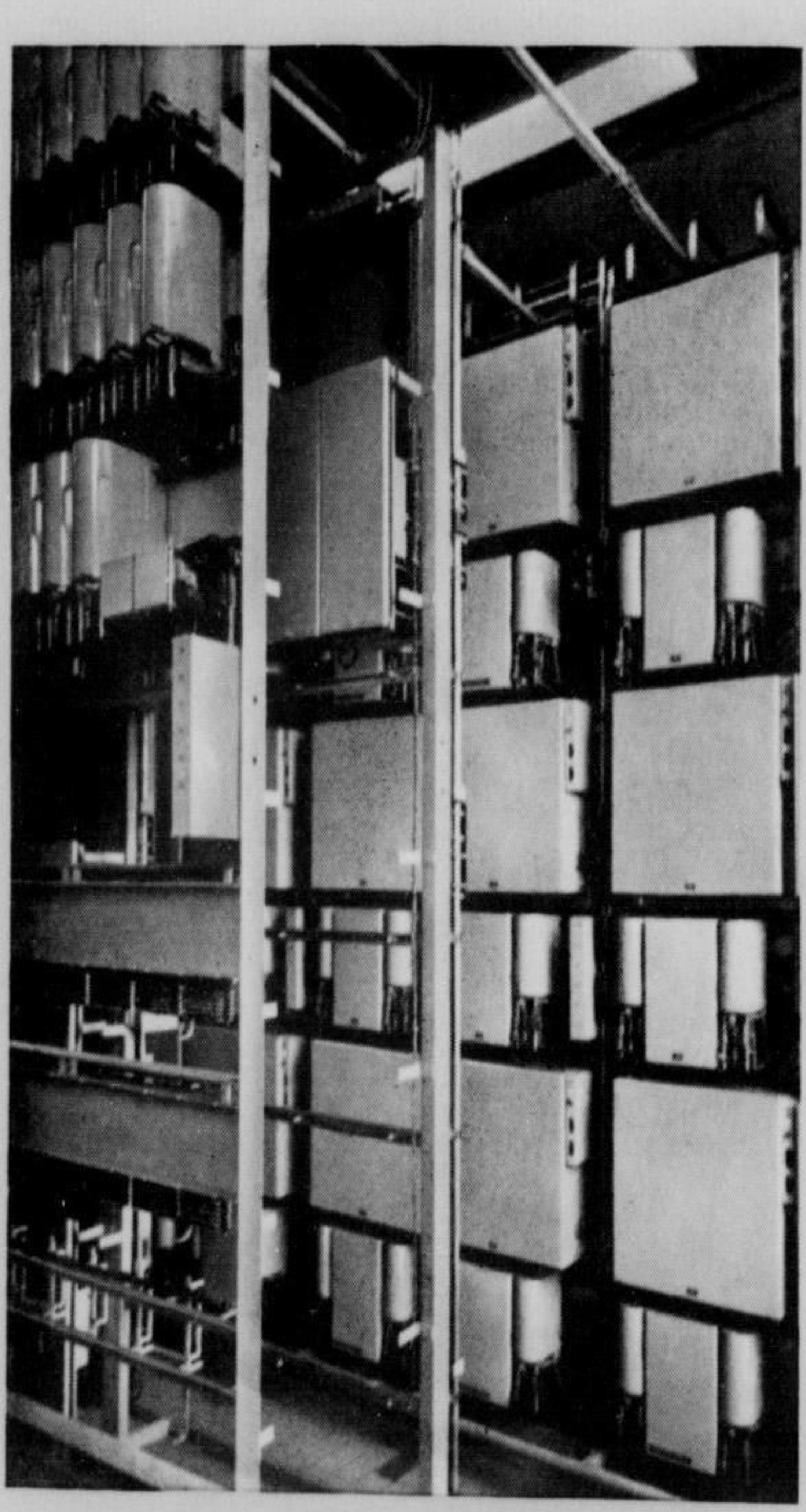
Highway and street traffic signals are a further important item in the Company's range of products, and include a wide variety of types for every need—synchronized and non-synchronized, and fixed time and traffic operated types.

Directly, or through the world-wide service organization of International Automatic Electric Corporation, Chicago, Automatique Electrique, S. A., supplies "ATEA" equipment and materials to telephone administrations and other purchasers in almost every part of the world.

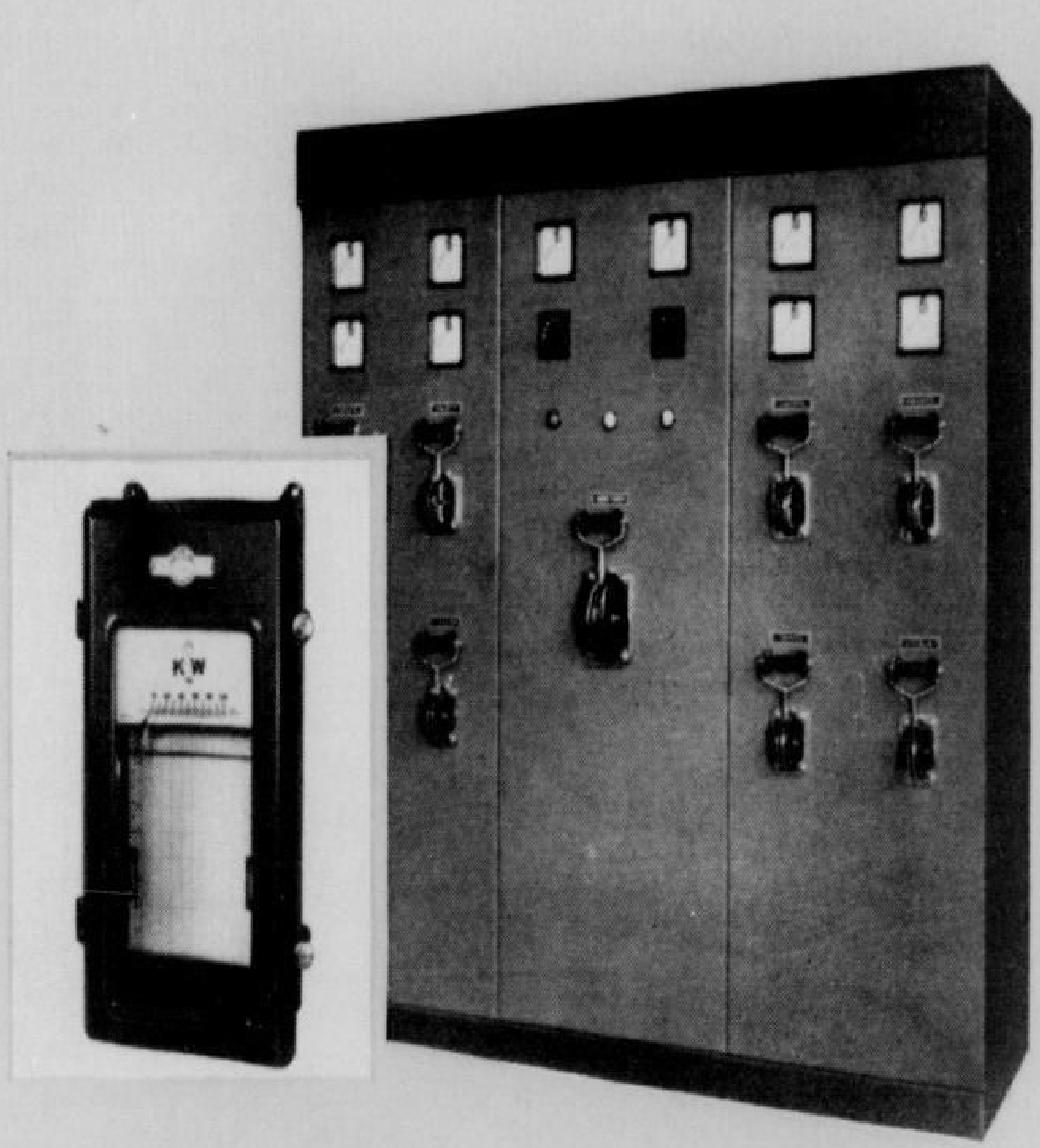


Automatique Electrique, S.A., is an important supplier of telephone equipment to the Belgian Régie des Télégraphes et des Téléphones. Above is shown a group of toll ticket printers supplied by ATEA for the exchange at La Louvière.

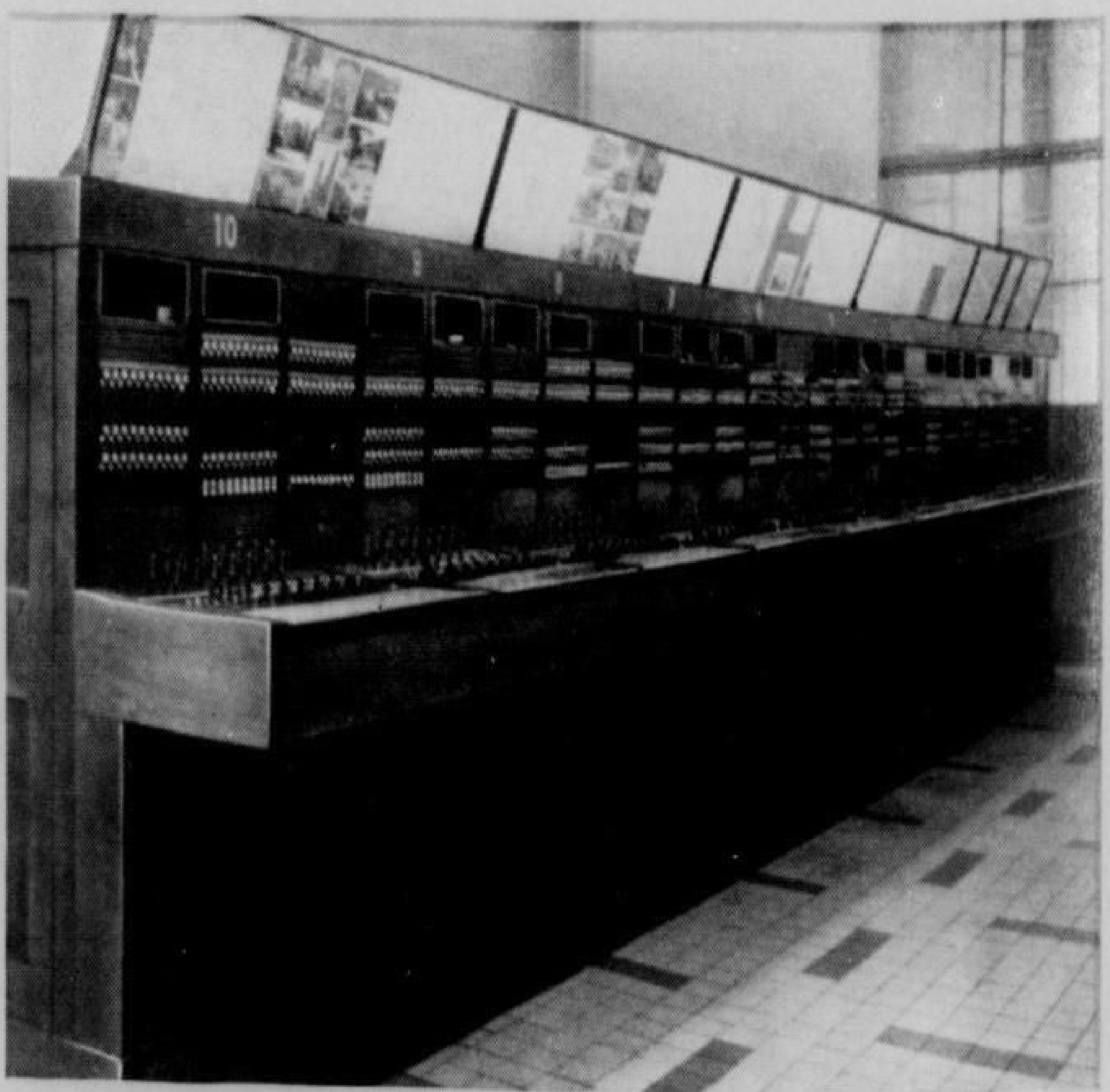
ATEA's Telephone and Electrical Products



Corner of La Louvière switchroom, showing Strowger Automatic Directors at right.

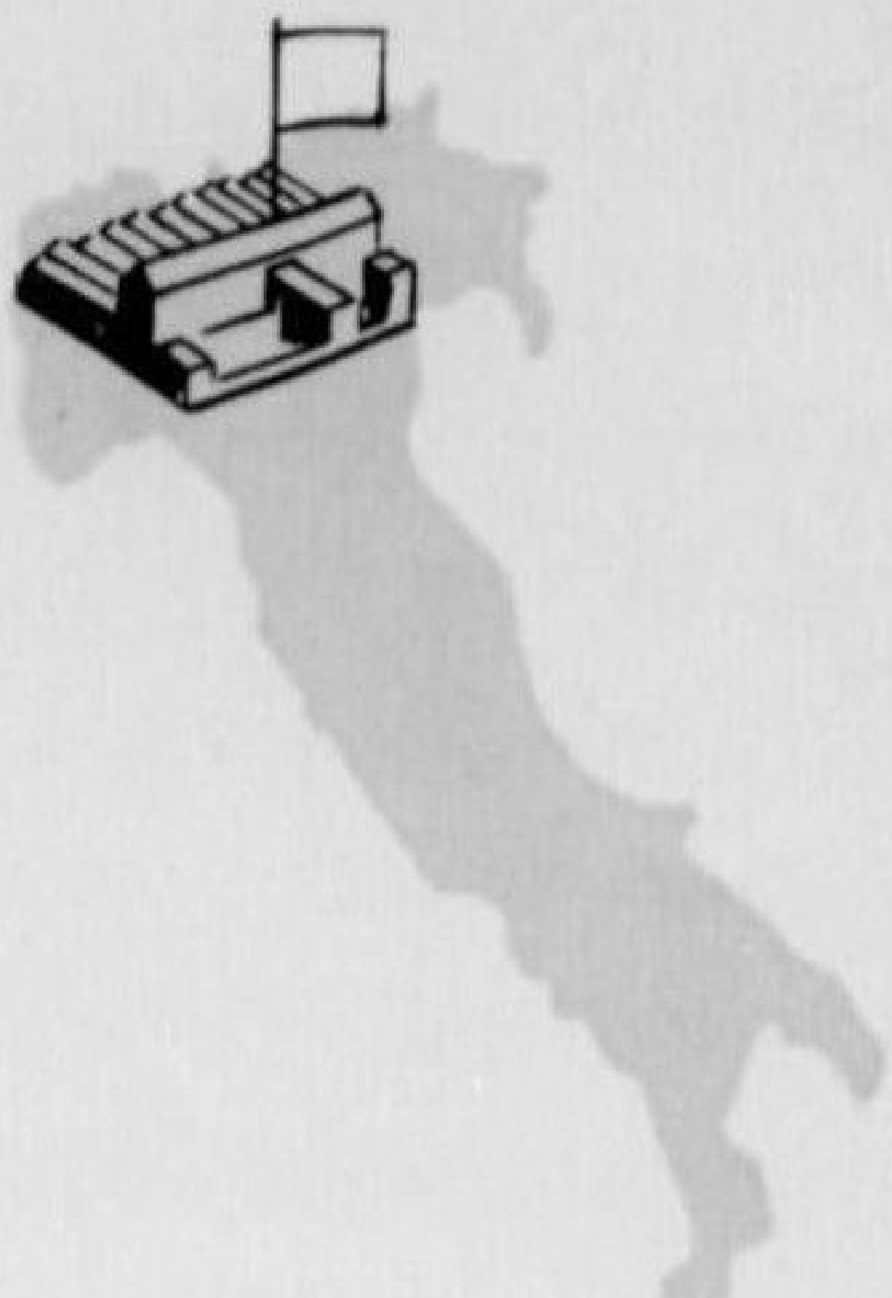


ATEA electrical measuring instruments find wide application in industrial and power plants. Inset shows an ATEA recording kilowatt meter.



This ten-position switchboard is typical of the manual equipment being supplied by ATEA for service in Belgium.

AUTELCO MEDITERRANEA, S.A.T.A.P.



AUTOMATIC ELECTRIC began its operations in Italy in 1926 with the assignment there of a field representative to bring the advantages of Strowger Automatic Telephone Equipment to the attention of telephone administration executives in Italy and neighboring countries. To expedite this work, the company opened a sales office in Milan in 1927, and as an outgrowth of this step a number of small public automatic exchanges and private automatic systems were manufactured in Chicago and supplied to various Italian telephone companies.

One of the most significant of these early projects was the equipping of the Seregno network in the Province of Milan . . a network comprising 24 exchanges with facilities for full automatic intercommunication and time and zone metering.

Telephone operating executives and engineers in Italy soon began to appreciate the excellent qualities of design and durability that characterize Strowger Automatic equipment; and to meet the steadily increasing demand for this equipment a technical staff was rapidly recruited and trained under the guidance of the Chicago organization.

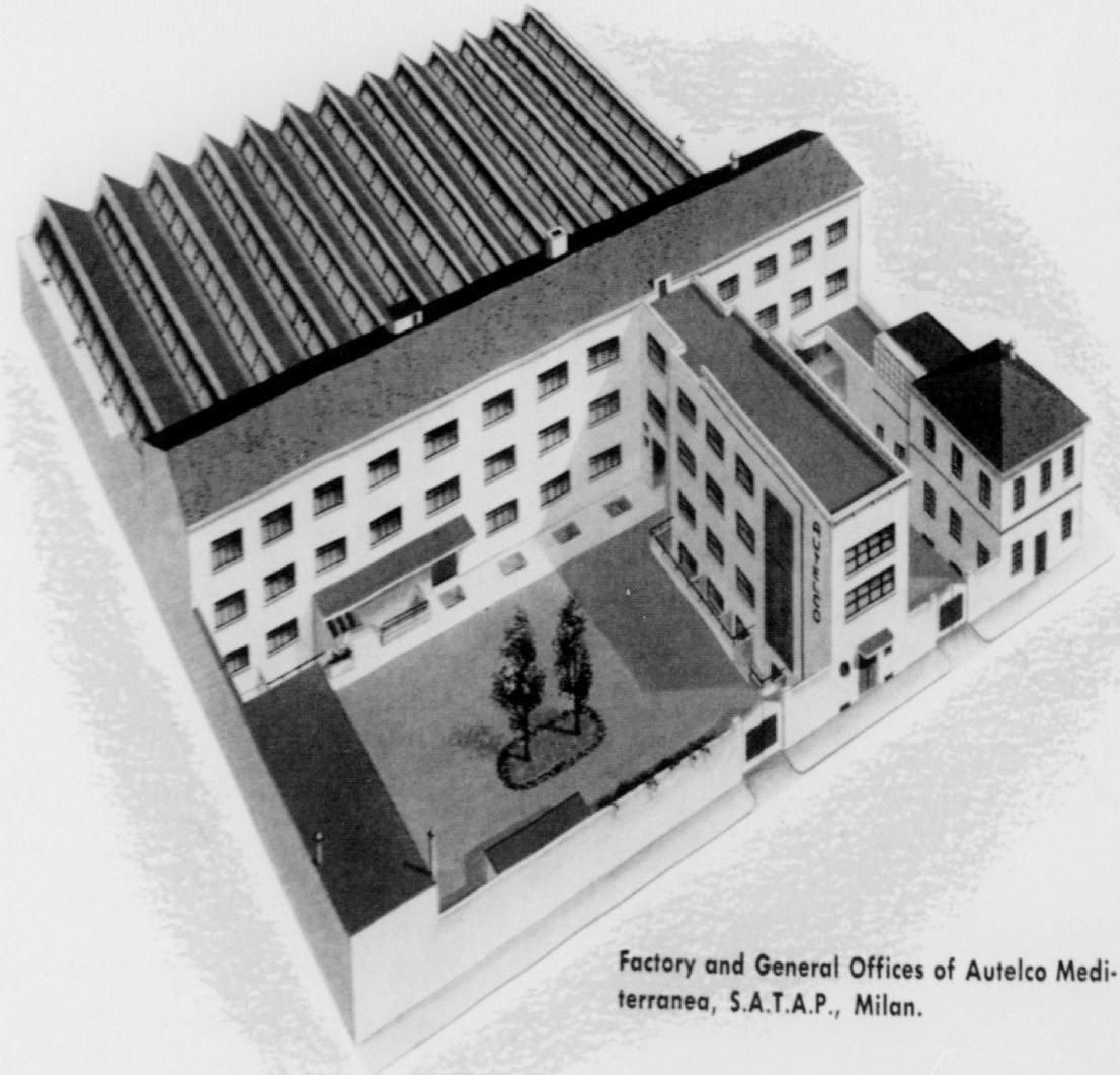
By 1936, these activities had grown to such magnitude that production of equipment in Italy became both feasible and desirable, and in 1937, Società Anonima Telefone e Apparacchi di Precisione (S.A.T.A.P.), in Milan, became a part of Automatic Electric. This company had long specialized in the design and manufacture of various types of telephone apparatus, and on this foundation of sound experience the present organization, known as Autelco Mediterranea, S.A.T.A.P., was built.

For a number of years further development was hampered by war conditions, but since 1946 expansion has been rapid and on a scale commensurate with the needs of the area directly served. Thoroughly modern facilities, carefully designed for the most economical and efficient operation, were created under the guidance of Automatic Electric production experts, while an engineering and production staff has been built up which is capable of designing and manufacturing Strowger Automatic equipment to meet every requirement.

An important development in the demand for Strowger Automatic equipment in Italy was the growing need for additional automatic offices in the cities of Milan and Rome. The earlier automatic offices in those cities were of German manufacture, based on Strowger principles but differing widely in circuit and mechanical detail, and made by a company originally licensed under Automatic Electric patents. Strowger Automatic additions to these networks, completed by Autelco Mediterranea during the period from 1947 to 1949 and interconnected with the original German-made equipment, have given full satisfaction—a further demonstration of the flexibility of Strowger Automatic design in meeting unusual conditions.

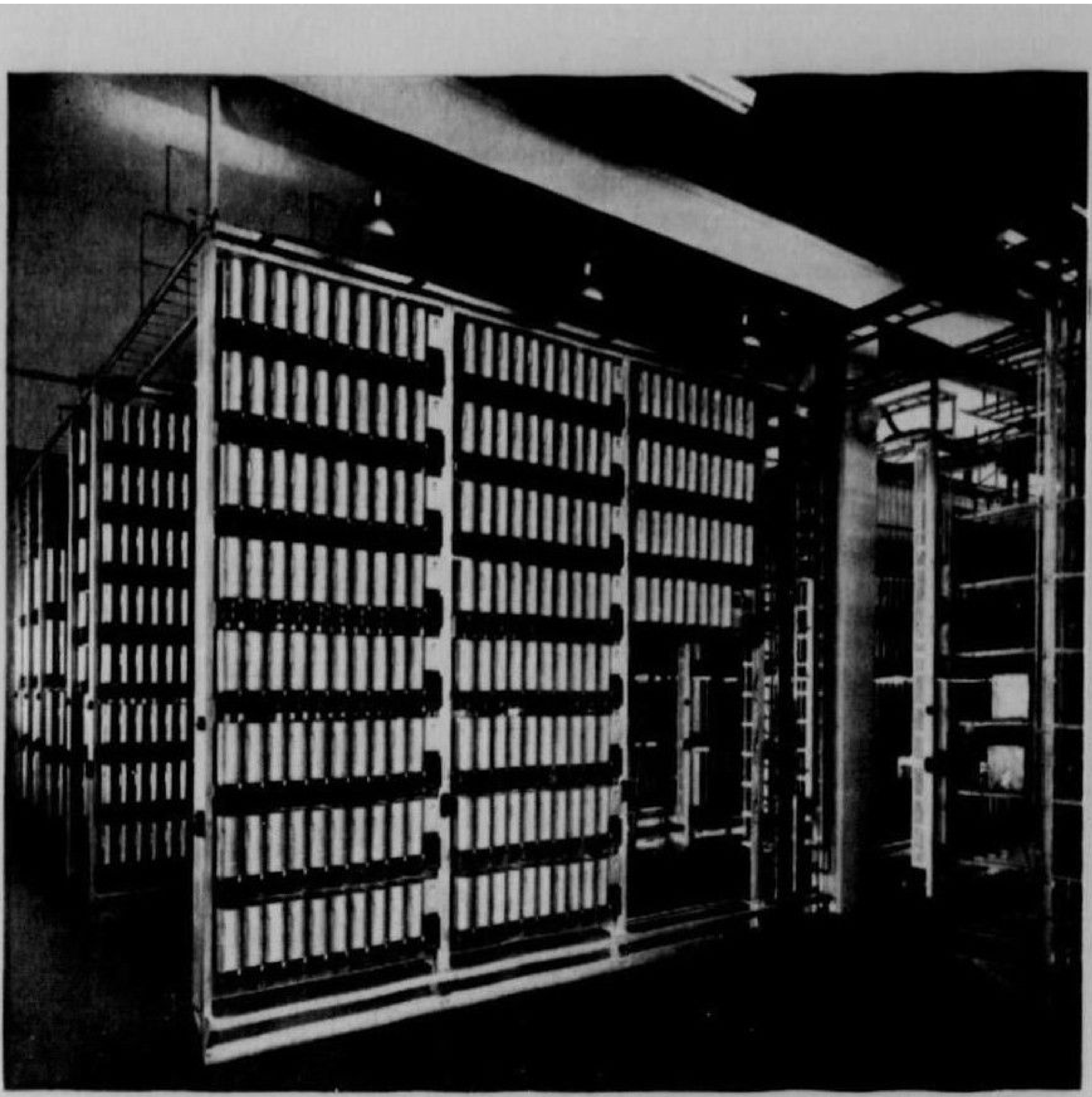
The Milan organization in 1950 moved into its new and enlarged manufacturing plant at Via Bernina 12, Milan, and today, with the progressive development of its expert technical, engineering, and development staffs, and with the addition of the most modern tools and production machinery, the Company is now in position to supply a full range of Strowger Automatic telephone equipment, and also continues to supply selective telephones and other train dispatching equipment to Italian railroad administrations.

Like other affiliates in the Automatic Electric group, Autelco Mediterranea distributes its products to purchasers either directly or through the world-wide facilities of International Automatic Electric Corporation.



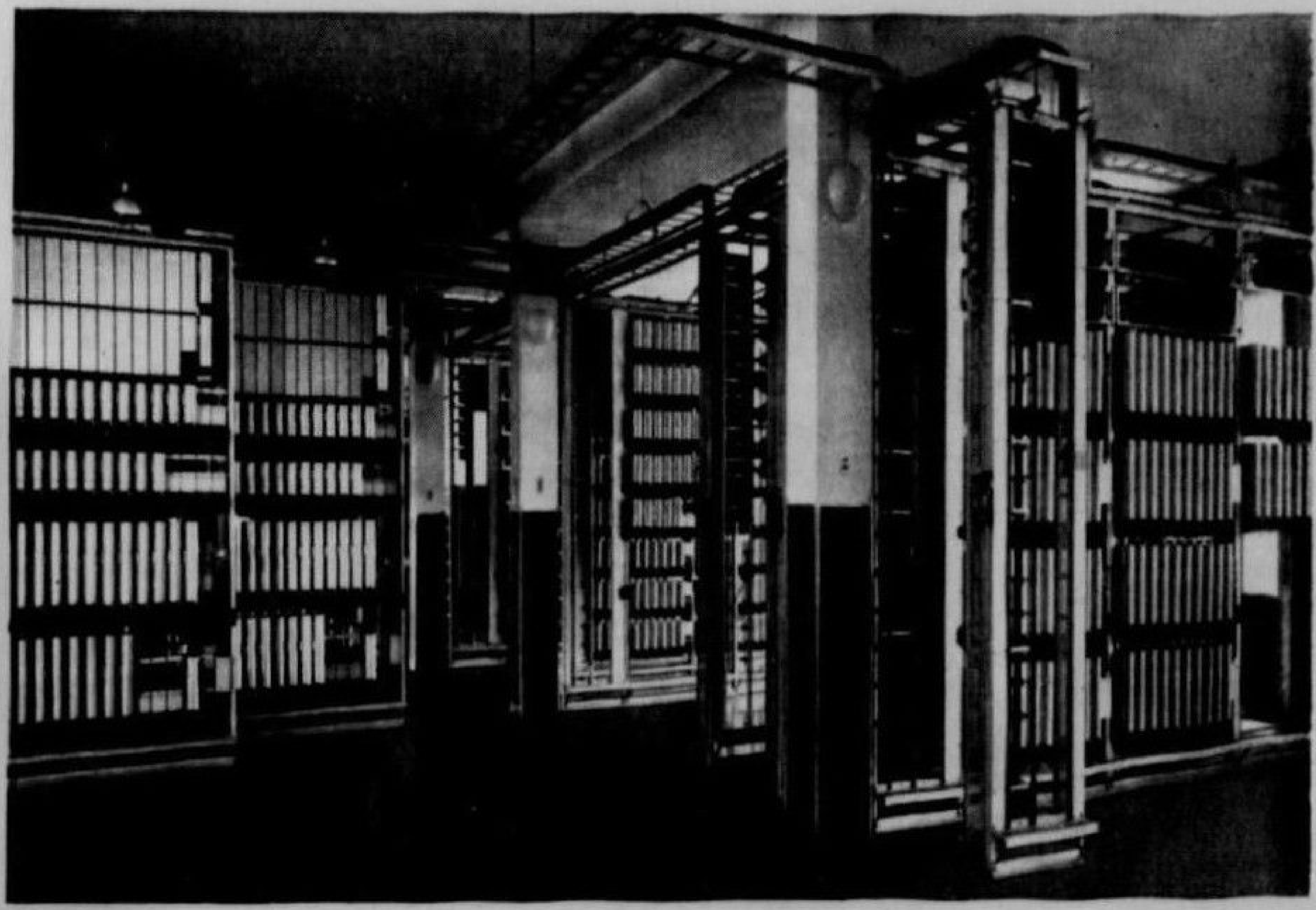
Factory and General Offices of Autelco Mediterranea, S.A.T.A.P., Milan.

Strowger Automatic in Italy



Bersaglio Strowger Automatic Exchange, Milan, Italy.

ON this page are shown some typical examples of Strowger Automatic exchanges in Italy, equipped by Autelco Mediterranea, S.A.T.A.P.

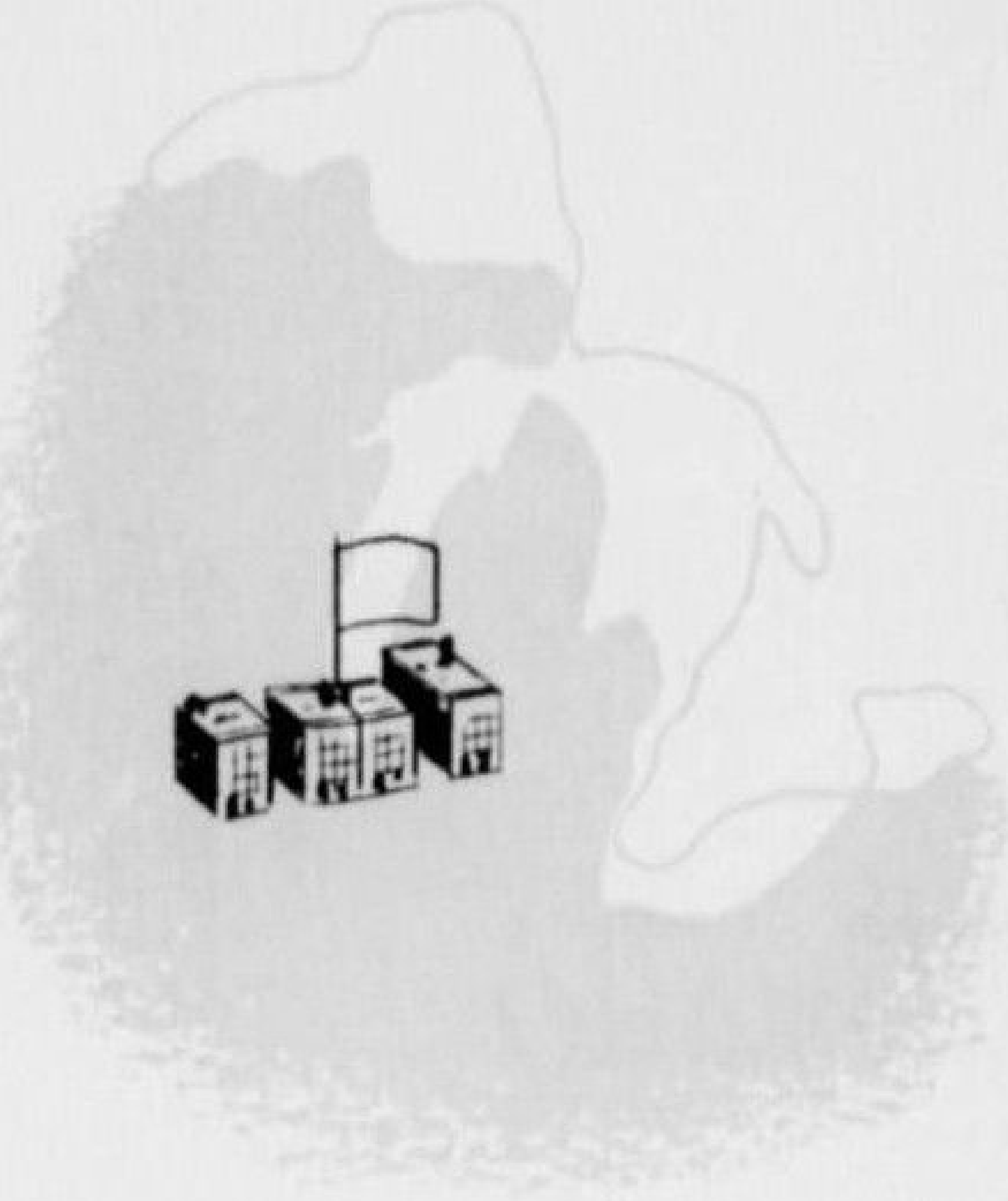


Piazza Napoli Exchange, Milan, Italy.

Strowger Automatic equipment at Rieti, Italy.

The Piazza Napoli exchange building at Milan, having a capacity of 10,000 lines of Strowger Automatic equipment.

AUTOMATIC
ELECTRIC
COMPANY

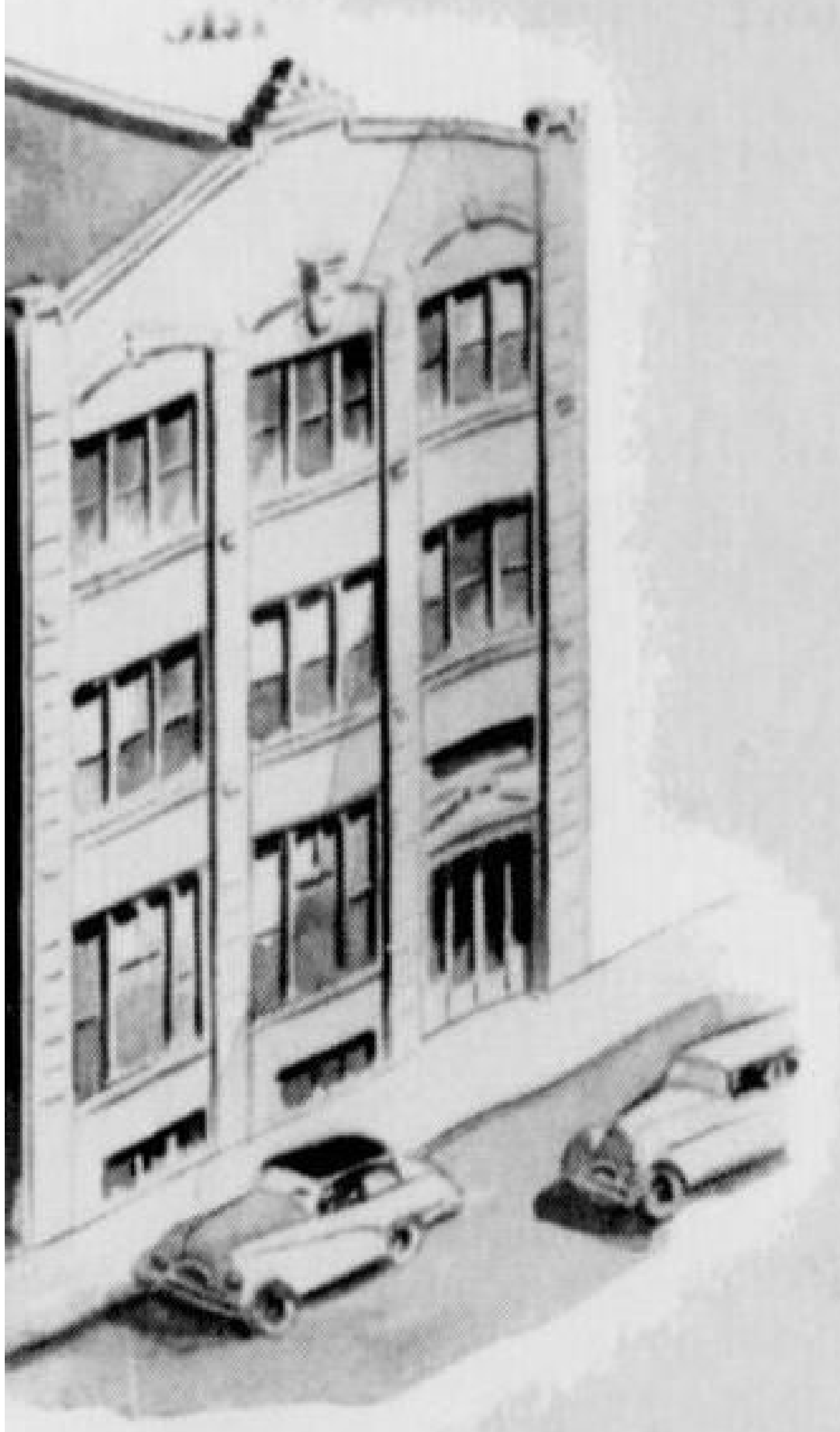


THIS, THE LARGEST of the manufacturing units of the Automatic Electric group, is the outgrowth of a company formed in 1891 as The Strowger Automatic Telephone Exchange for the development and manufacture of the automatic telephone system originally devised by Almon B. Strowger. The present company was organized in 1901, when a six-story manufacturing plant was erected at the intersection of Morgan and Van Buren streets on the west side of Chicago, U.S.A. Growth since that time has continued without interruption; today the Company has 11 large buildings in that immediate area.

For many years after the Chicago plant was first established, its business was devoted exclusively to the development, engineering and manufacture of Strowger Automatic telephone equipment, and today this activity remains the mainstay of the Company's operations. In addition the Company manufactures a wide variety of other apparatus in the broad field of communications and electrical and electronic controls. Its operations embrace every step from basic ideas and raw materials to the finished product. The general office building at 1033 West Van Buren Street houses the executive and administration offices, research and testing laboratories, the equipment engineering and drafting staffs, and auxiliary sales and service organizations, and also houses the headquarters of International Automatic Electric Corporation. The remaining buildings are devoted to the manifold aspects of processing, manufacturing, warehousing and shipping which are involved in the supply of communications and electrical control equipment to meet the widely varying needs of the company's customers.

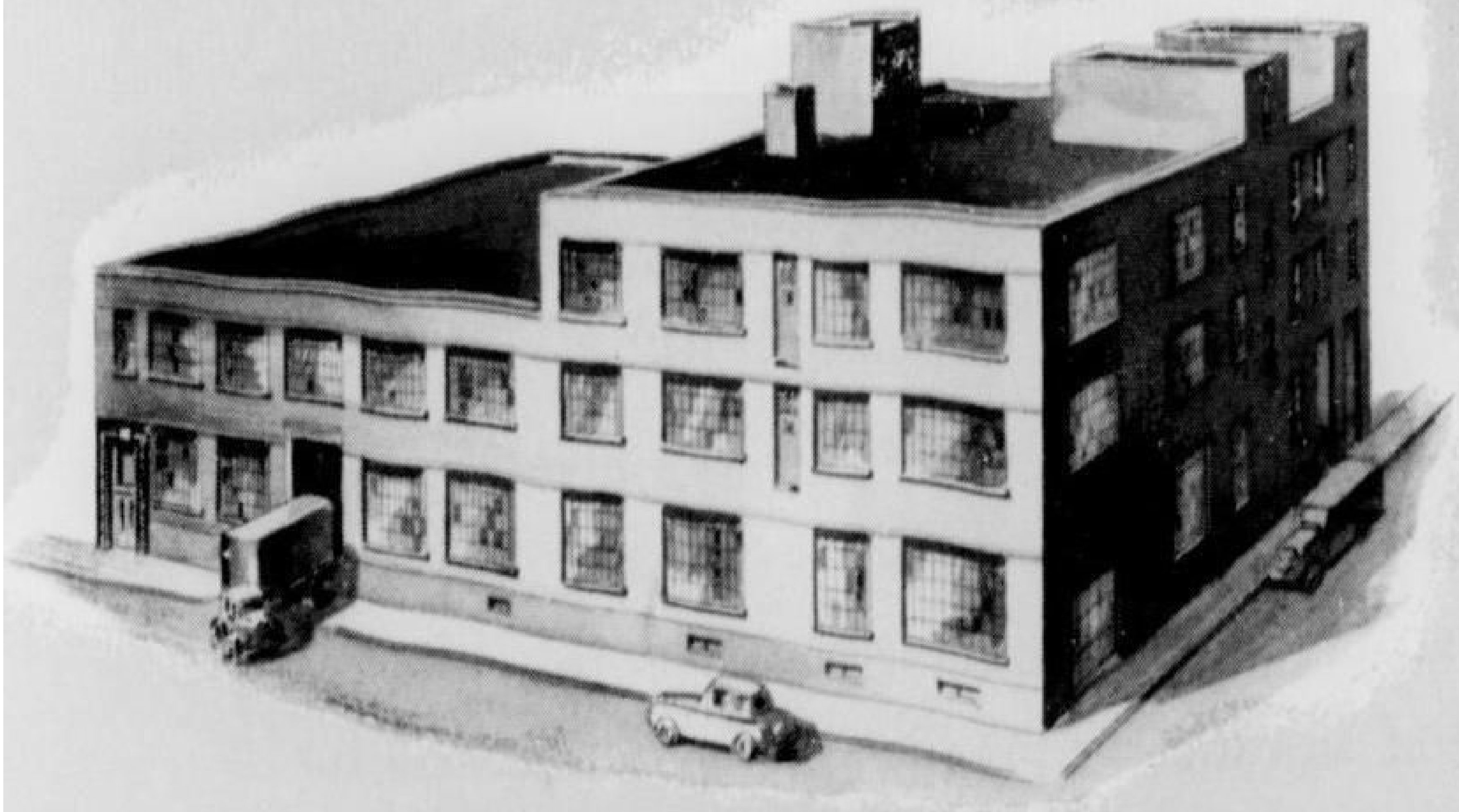
The personnel of the Chicago company and its immediately affiliated sales and service companies numbers well over 5000 employees, and it is significant to its customers that this combined group has had continuity of organization for over sixty years. At all times throughout this long period, the preponderance of personnel has been experienced in the design, engineering and production of automatic equipment.

The Automatic Electric Group in Chicago



Building 5 — Training School and Miscellaneous Office Departments.

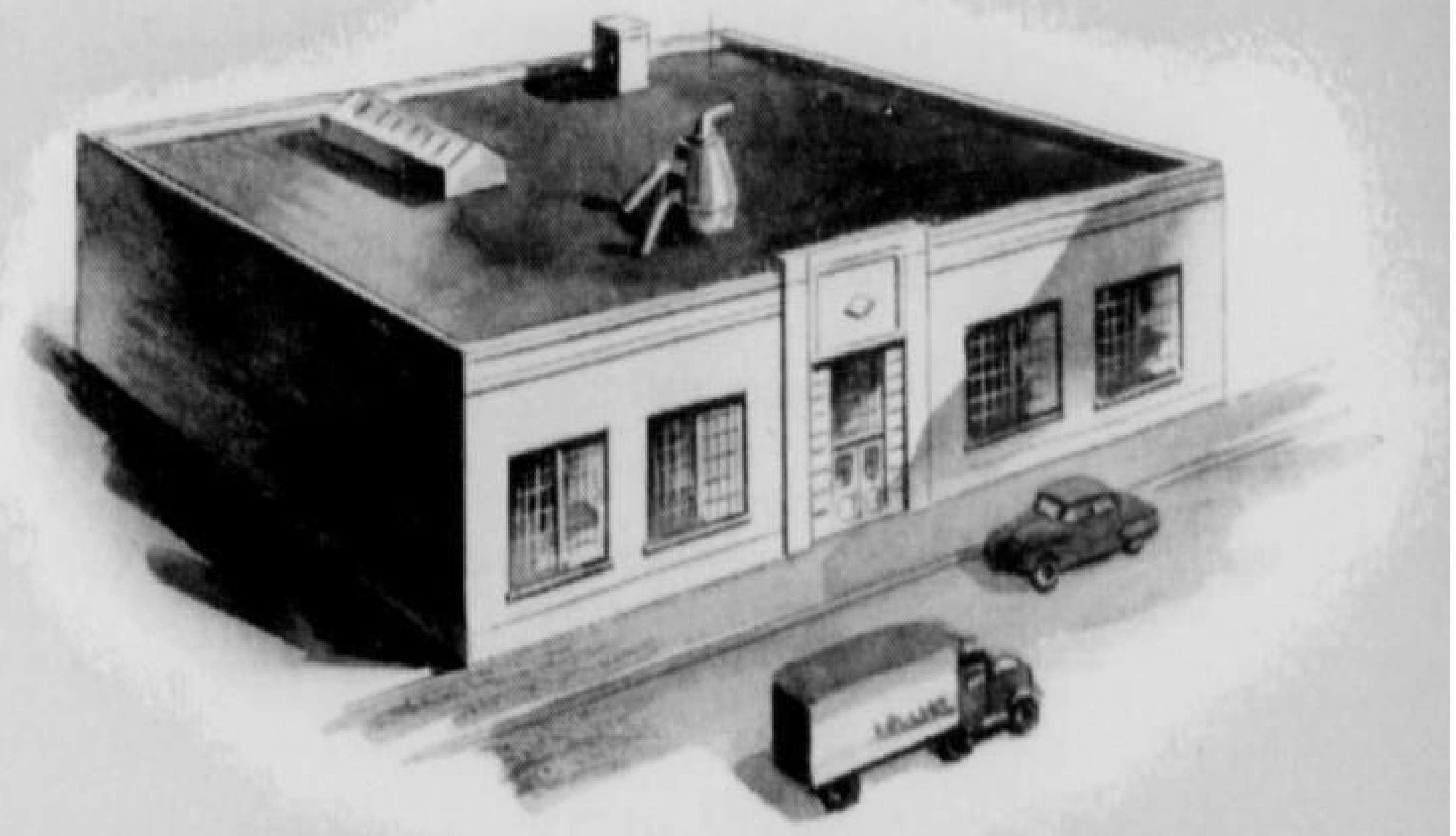
HERE are the Automatic Electric headquarters in Chicago, U.S.A., where automatic telephony was first brought to the stage of practical utility and economy, and where trained minds and hands, aided by long experience, are constantly at work to keep Strowger Automatic equipment abreast of ever-expanding needs. Above are shown Buildings 1 to 4 inclusive.



Building 8 — Supply Headquarters.

Building 9 — Automatic Switchboard Assembly.

Building 7 — Telephone and Industrial Specialty Departments.



Building 6 — Plastic Molding Department.

THE GROWTH OF STROWGER AUTOMATIC

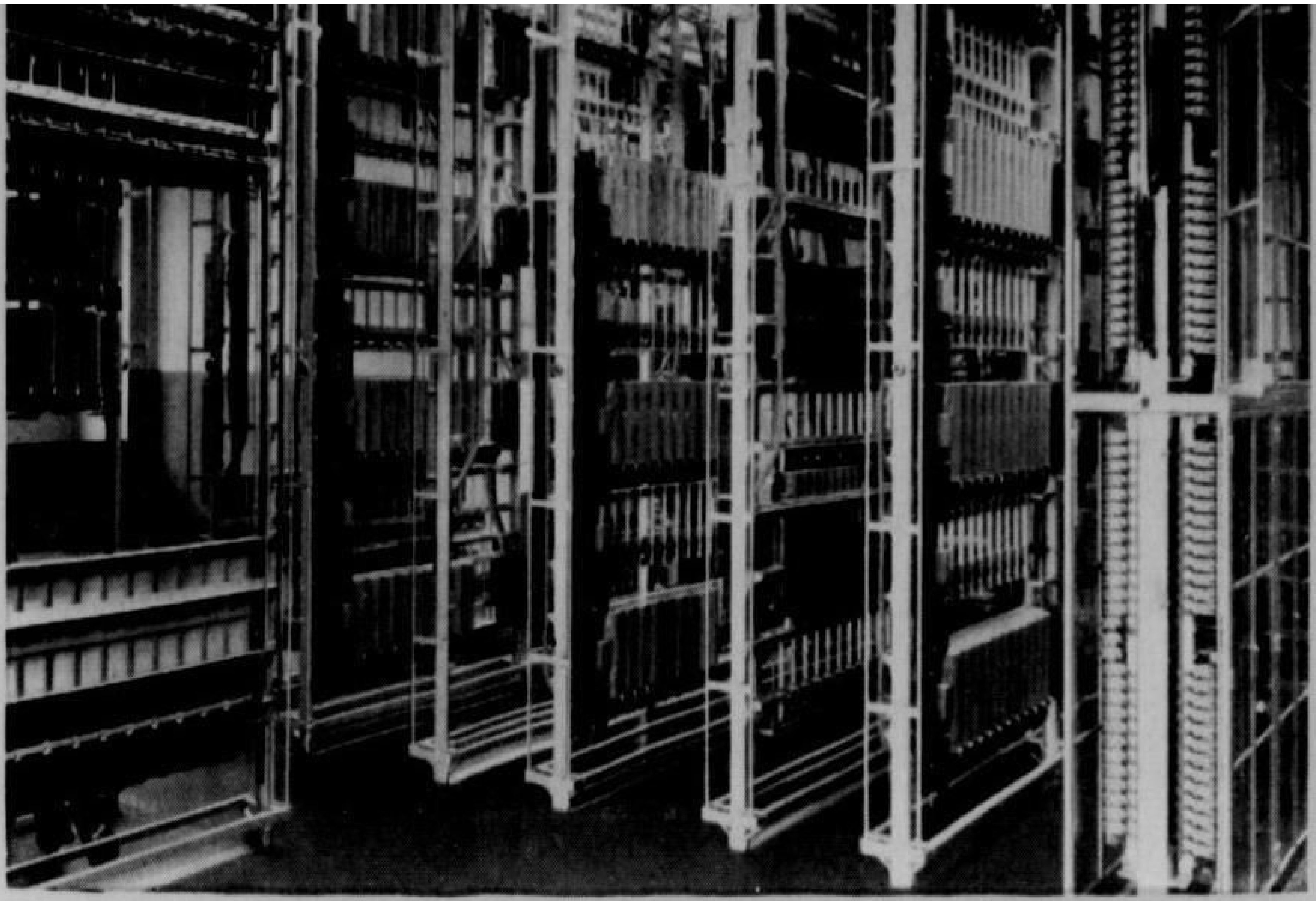
It is altogether natural that the Strowger Automatic system, as created and developed by Automatic Electric, should have found its first wide application in the country of its origin, where telephone service is rendered jointly by the extensive networks of exchanges of the Bell Telephone System, and those of the thousands of Independent companies.

Up to the year 1919, the Independent telephone companies of the United States represented the largest single group of customers for the Automatic Electric organization in Chicago, and that status remains unchanged today. These companies — there are more than six thousand of them — serve more than two-thirds of the geographic area of the United States, and almost twice as many communities as are served by the Bell System. In size, they range from a score or so telephones to multi-office networks of a hundred thousand or more stations. Their exchanges and toll lines are interconnected with those of neighboring companies and also with the nationwide long distance network of the Bell System.

It was largely through close cooperation between the Independent companies of the United States and Automatic Electric Company, of Chicago, that the Strowger Automatic system was brought to the stage of practical perfection, and these companies also have been largely responsible for the development of operating techniques which have since been applied on a world-wide scale. Today, the majority of Independent automatic exchanges use Strowger Automatic equipment supplied by Automatic Electric. The year 1919 marked the beginning of an extensive program by the Bell System for the installation of Strowger Automatic telephone equipment in both large and small exchanges. Under this program Automatic Electric manufactured and installed the first Strowger Automatic system designed specifically for the Bell System. This was an 11,000-line exchange for Norfolk, Virginia, U.S.A., completed in December, 1919.

During that year also, Automatic Electric entered into long term contracts with the Bell System for the engineering and manufacture of equipment for other similar installations. For many years thereafter, the bulk of Strowger Automatic telephone equipment installed for the Bell System was made in the Automatic Electric factory at Chicago. Today Strowger Automatic telephone equipment still predominates in Bell System automatic exchanges, and the program initiated in 1919 has steadily increased in scope through the years.

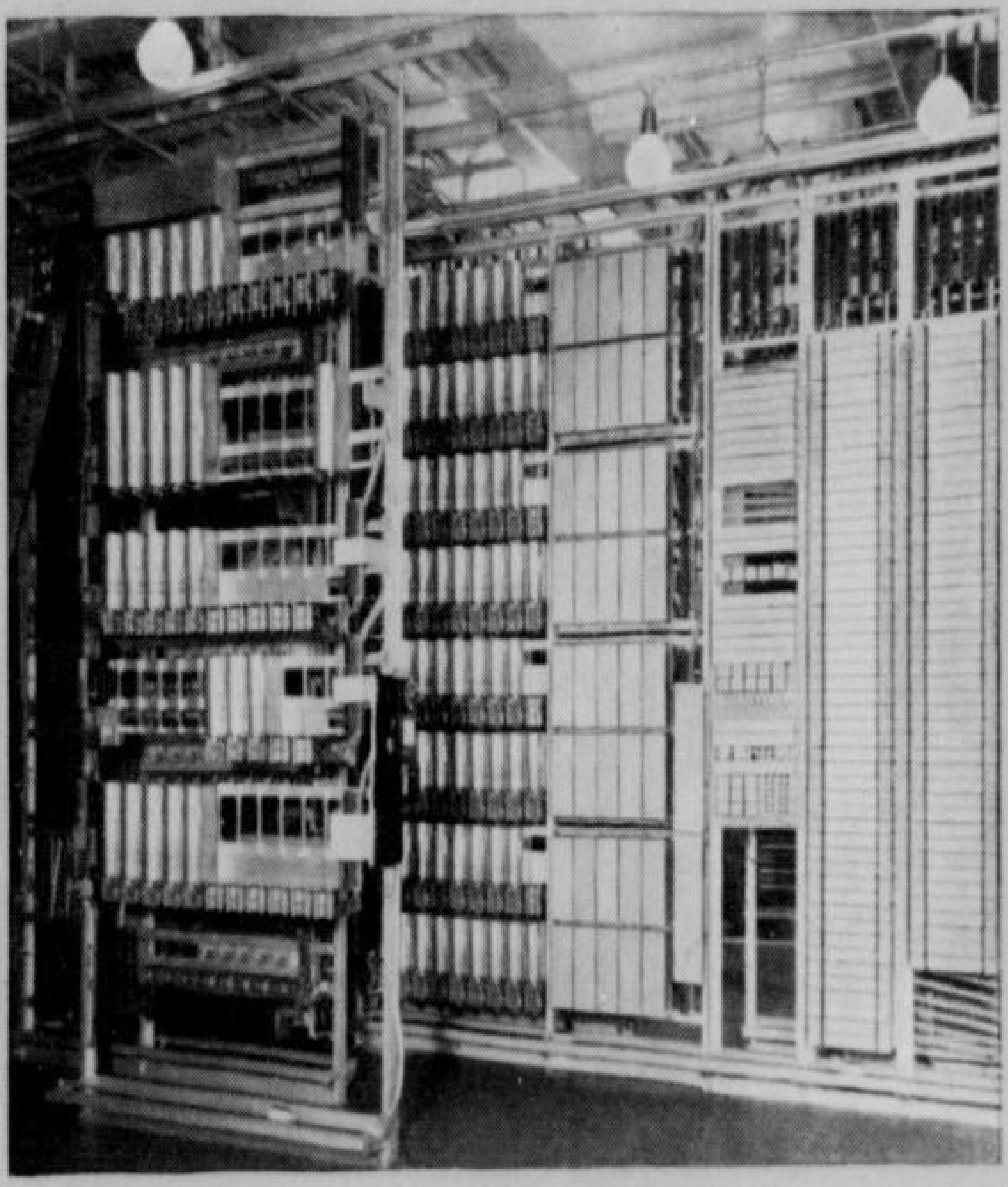
St. Paul, Minnesota, one of the many hundreds of Bell System exchanges using Strowger Automatic equipment.



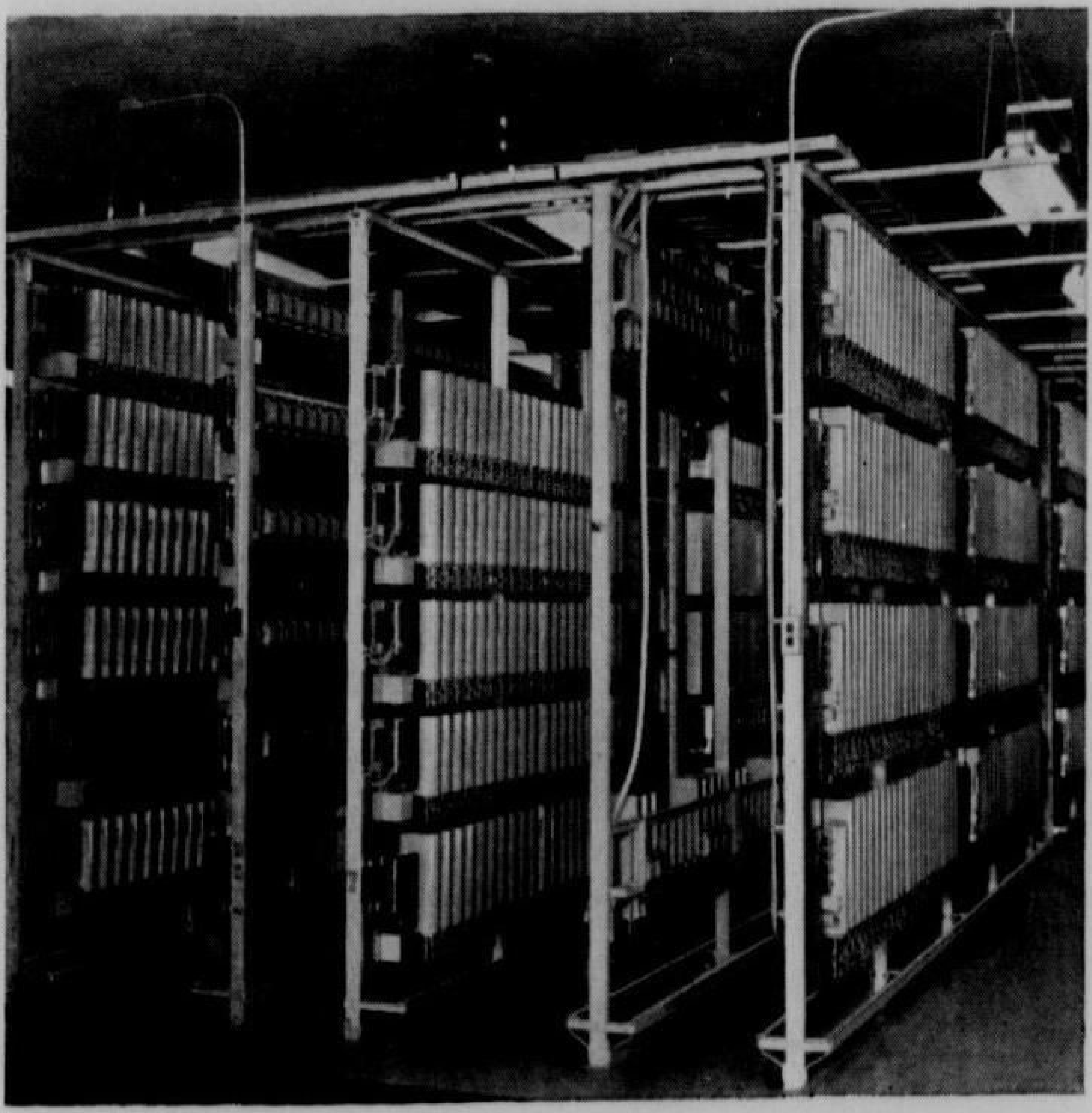
Strowger Automatic in the United States

Bloomington, Illinois, U.S.A. (Illinois Telephone Company).

DURING the first 30 years of its development, Strowger Automatic was the only now surviving system used in public exchanges in the United States. In automatic exchanges being installed today, Strowger Automatic remains the predominant choice of both Independent and Bell System companies. A few typical installations are shown on this page.



Logansport, Indiana, U. S. A. (Indiana Associated Telephone Company).



Chillicothe, Ohio, U.S.A. (Chillicothe Telephone Company).

STROWGER AUTOMATIC THROUGHOUT THE WORLD

AGAINST THE BACKGROUND of early success in the United States, it was inevitable that telephone operating administrations in other countries should become interested in the advantages of Strowger Automatic equipment. The system made its first appearance abroad in London in 1898—an exhibit switchboard of 200-line capacity. A year later, the German Post Office purchased a 400-line system which they installed for public service in Berlin. These two installations were the earliest forerunners of the world penetration that was soon to come.

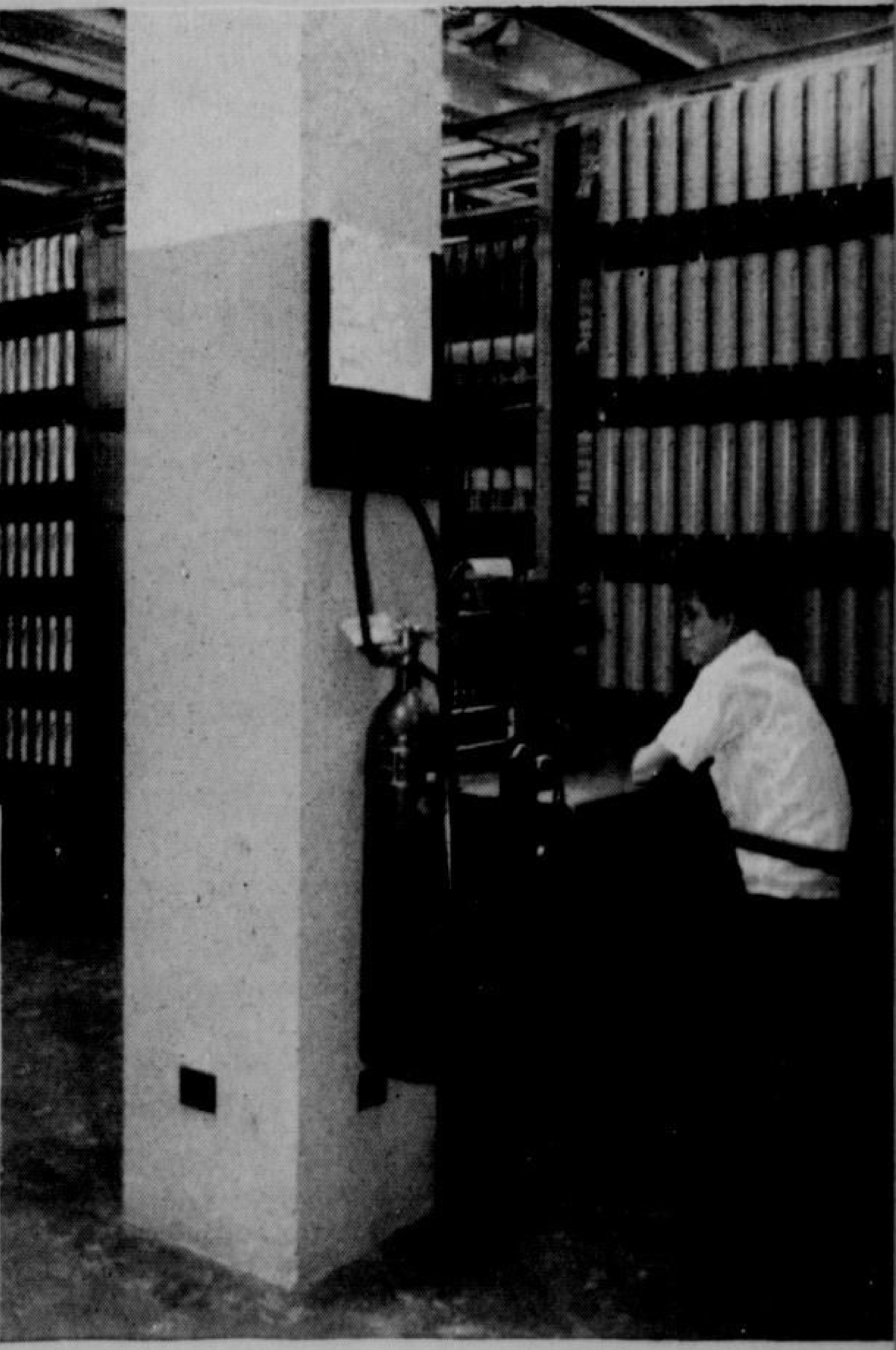
Canada, Cuba and Australia were among the first countries to recognize the manifold benefits of the Strowger system and to adopt it on a widespread scale. Argentine, India and New Zealand soon followed. For many years, all of the Strowger Automatic telephone equipment installed in these and other countries was manufactured and installed by the Automatic Electric organization.

Keeping pace with this wide-spread acceptance of the Strowger system by operating administrations, the principal manufacturers of telephone apparatus in Europe and the United States, recognizing that Strowger Automatic would dominate and underlie all future progress, sought licenses under Automatic Electric's numerous basic patents and these were extensively granted.

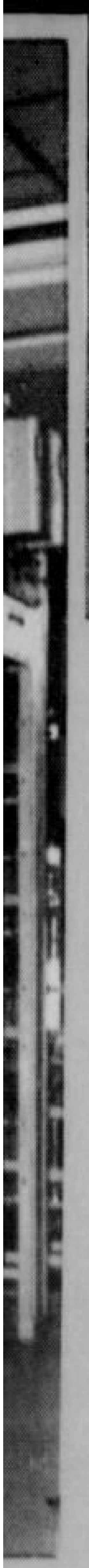
Today, the leading telephone administrations throughout the world use Strowger equipment as standard, and the telephone systems of most of the world's important cities are partially or wholly converted to that type of operation. In Great Britain, the British Post Office, after the most exhaustive studies and tests, standardized on the Strowger Automatic system and is using it exclusively, both in London and in scores of provincial cities. The government-operated telephone systems of Australia, South Africa and some of the Canadian provinces have also standardized on Strowger.

Typical cities using equipment based on Strowger Automatic principles include Vancouver, Toronto and Winnipeg in Canada; Buenos Aires, Rosario and Cordoba in Argentine; Sydney and Melbourne in Australia; Havana, Cuba; Honolulu and Manila in the Pacific; Berlin and other principal cities in Germany; the principal cities in China and Japan; Sao Paulo and Petropolis in Brazil; and the principal cities in Venezuela, Colombia, Uruguay, and other Latin American countries.

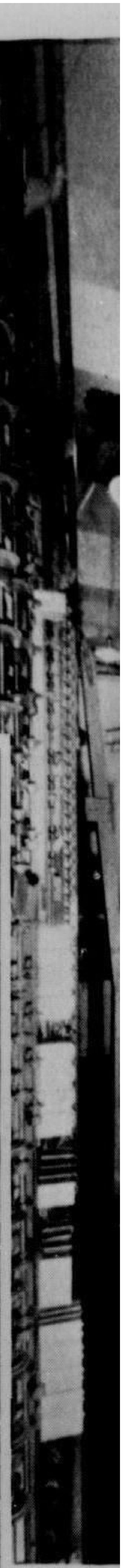
Automatic central office at Milan,
ibers' meters are shown at the left.



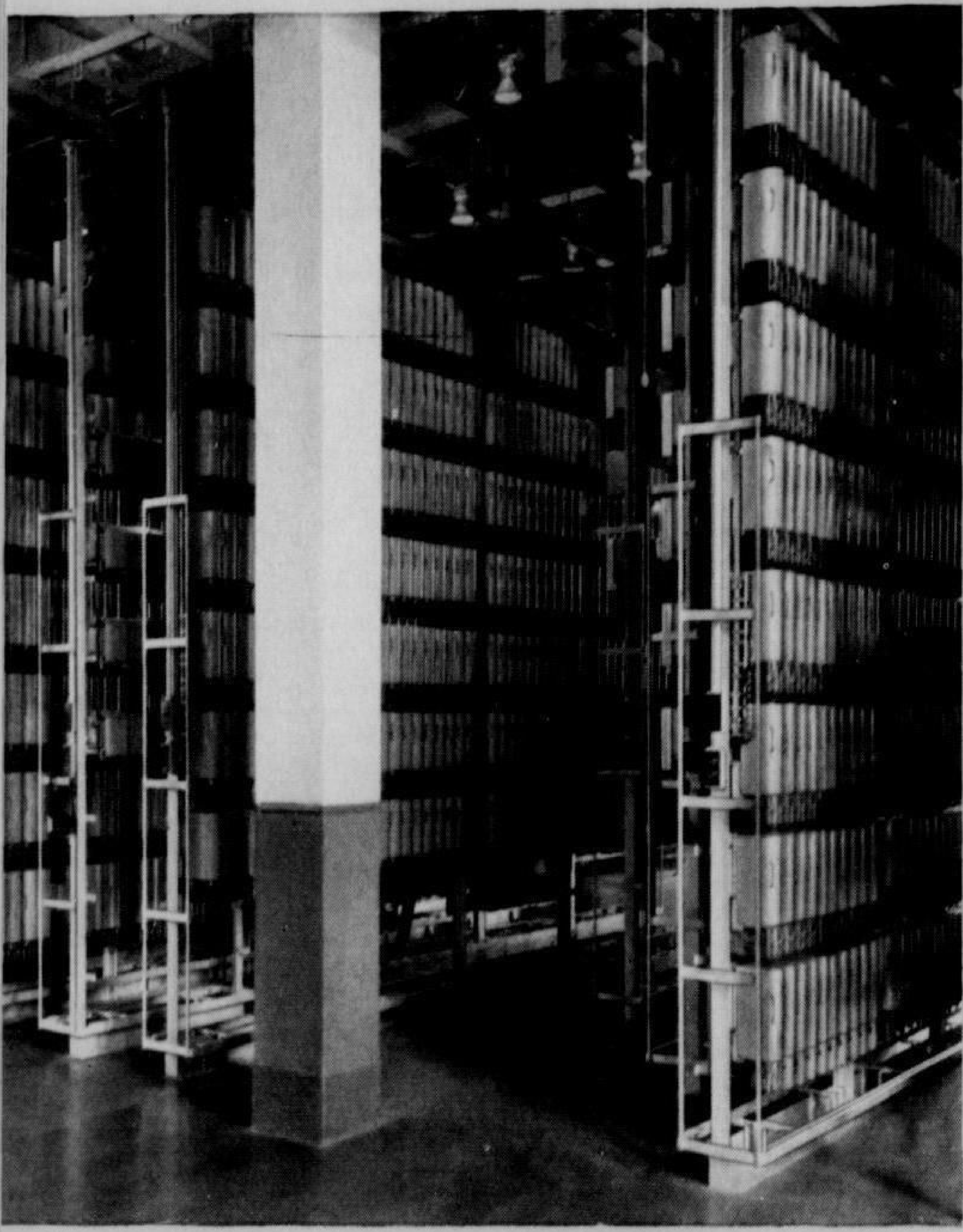
Honolulu, T. H. (Mutual Telephone Company).



Manila, Philippine Islands. (Philippine Long Distance Telephone Company).

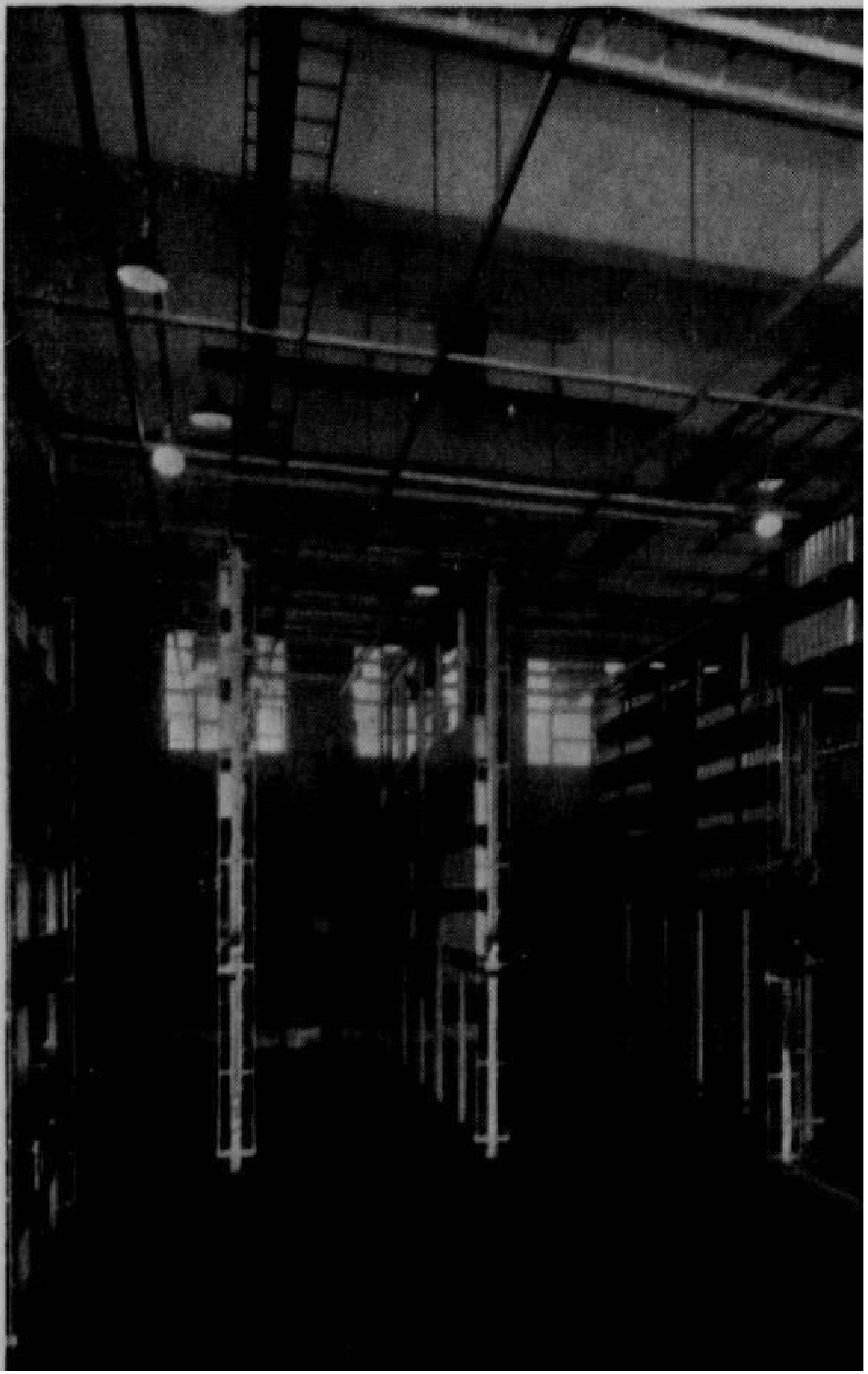


Strowger Automatic equipment at Ciudad Trujillo, Dominican Republic, installed as an addition to a Rotary (power driven) switchboard, shown at left. (Compañía Dominicana de Teléfonos, C por A.)



Victoria
Columb

São Paulo, Brazil
(Companhia Telephonica
Brasileira)



THE AUTOMATIC ELECTRIC LABORATORIES

HAVING ITS INCEPTION at a time and in an area of intense competition in the telephone field, the development of Strowger Automatic equipment was, of necessity, guided into channels of the utmost utility, from which it has never deviated. But realizing also that, like a chain, an operating telephone system is only as good as its weakest link, Automatic Electric's research scientists, designing engineers and production technicians have never ceased to strive for perfection in all of its many varieties of apparatus. From the subscriber's telephone and calling device to the most intricate problems of local and long distance switching and transmission, new and revolutionary developments have been undertaken and brought to success, while traditional and proved equipment has been constantly refined through the use of better materials, more precise fabrication and rigid inspection throughout the whole production process, thereby insuring more reliable operation and longer service life.

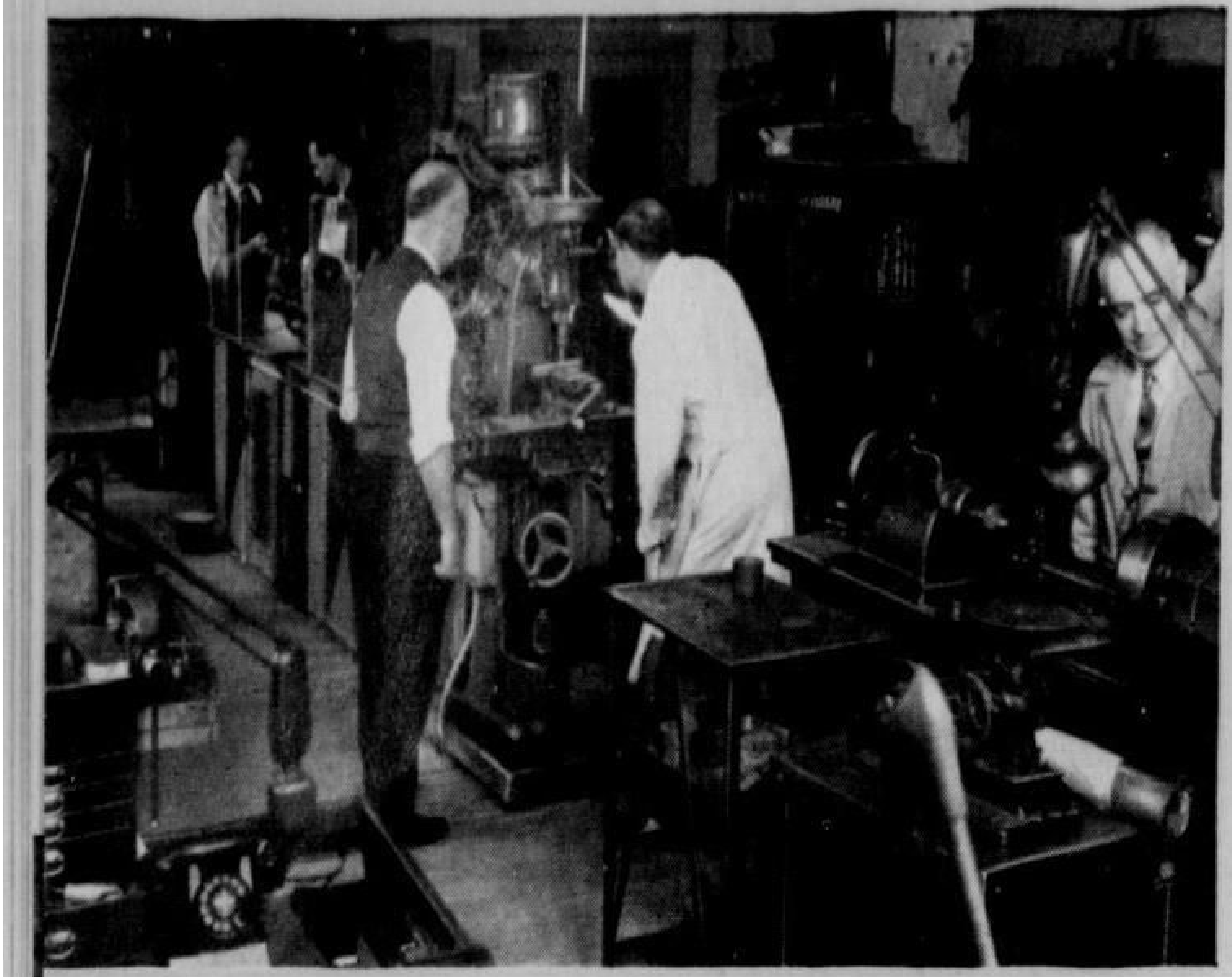
The keystone of Automatic Electric's outstanding position in the telephone industry today is found in its extensive system of research and development laboratories—the only group of its kind in the world which has the benefit of continuity of organization, and development records and experience extending back to the beginning of automatic telephony. Equipped with the most modern apparatus, much of it specially devised to meet particular requirements, and staffed by groups of mature men with life-long experience in telephone science in all its branches, these Laboratories engage in a number of major activities directed to the creation of new systems and products, to the improvement of older products, and to the adaptation of existing designs to the new needs which are constantly arising in the field.

An important division of the Laboratories is the Analytical Research staff, whose members carry on basic physical and electrical research, as well as investigations dealing with the fundamental principles of techniques and equipment for the purpose of discovering the most promising lines of attack for the meeting of future needs. This staff is an important influence in the development of new ways of meeting conditions which arise from the constantly expanding scope and complexity of communication science.

A second, and equally vital, function of the Laboratories staff is to devise, test, and perfect new circuits and new types of apparatus. Some of these are to meet special conditions peculiar to the operations of a particular customer, while others are pio-

Right: A member of the Laboratories staff is shown here analyzing the circuit functions of a new Director development.

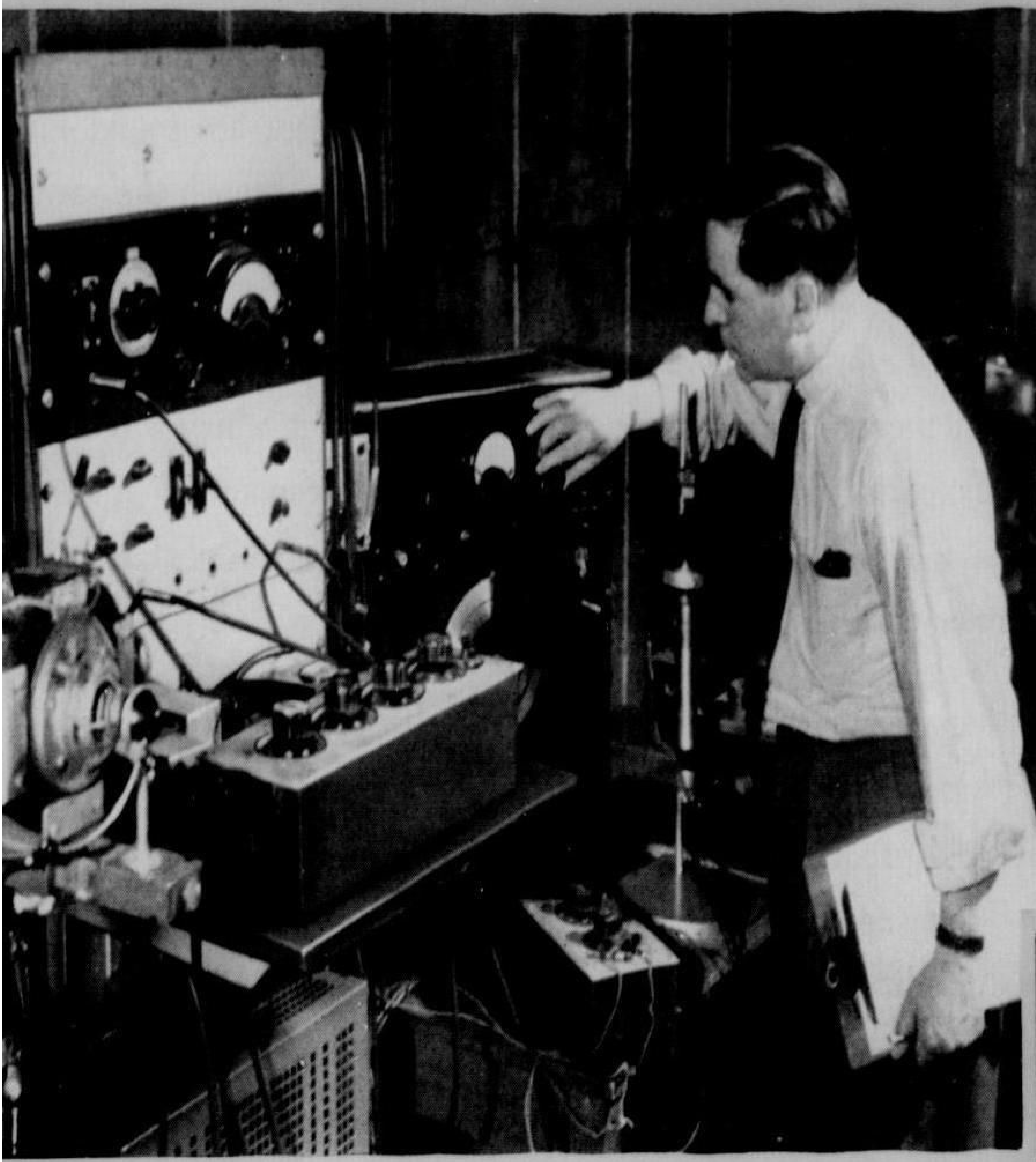
In the Automatic Electric Model Shop, prototypes of new products take shape.



Where Tomorrow's Equipment Begin

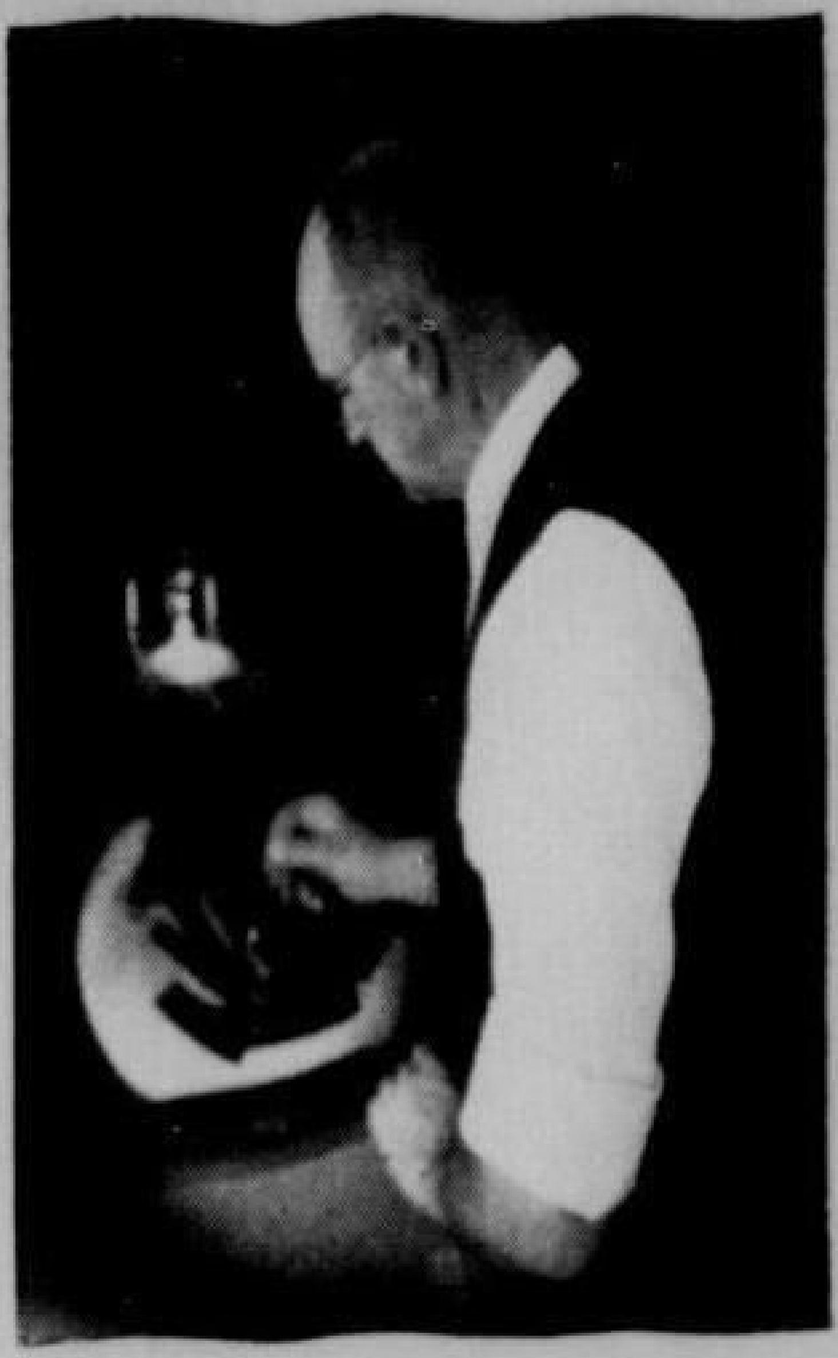
HERE in the Automatic Electric Laboratories is creative enterprise in telecommunications at its finest. Here new ideas take shape and are put to the test. Some are discarded because they fail to meet the challenge of service or economy. Those that survive exacting standards are added to the list of Automatic Electric achievements, as new products or improved designs.

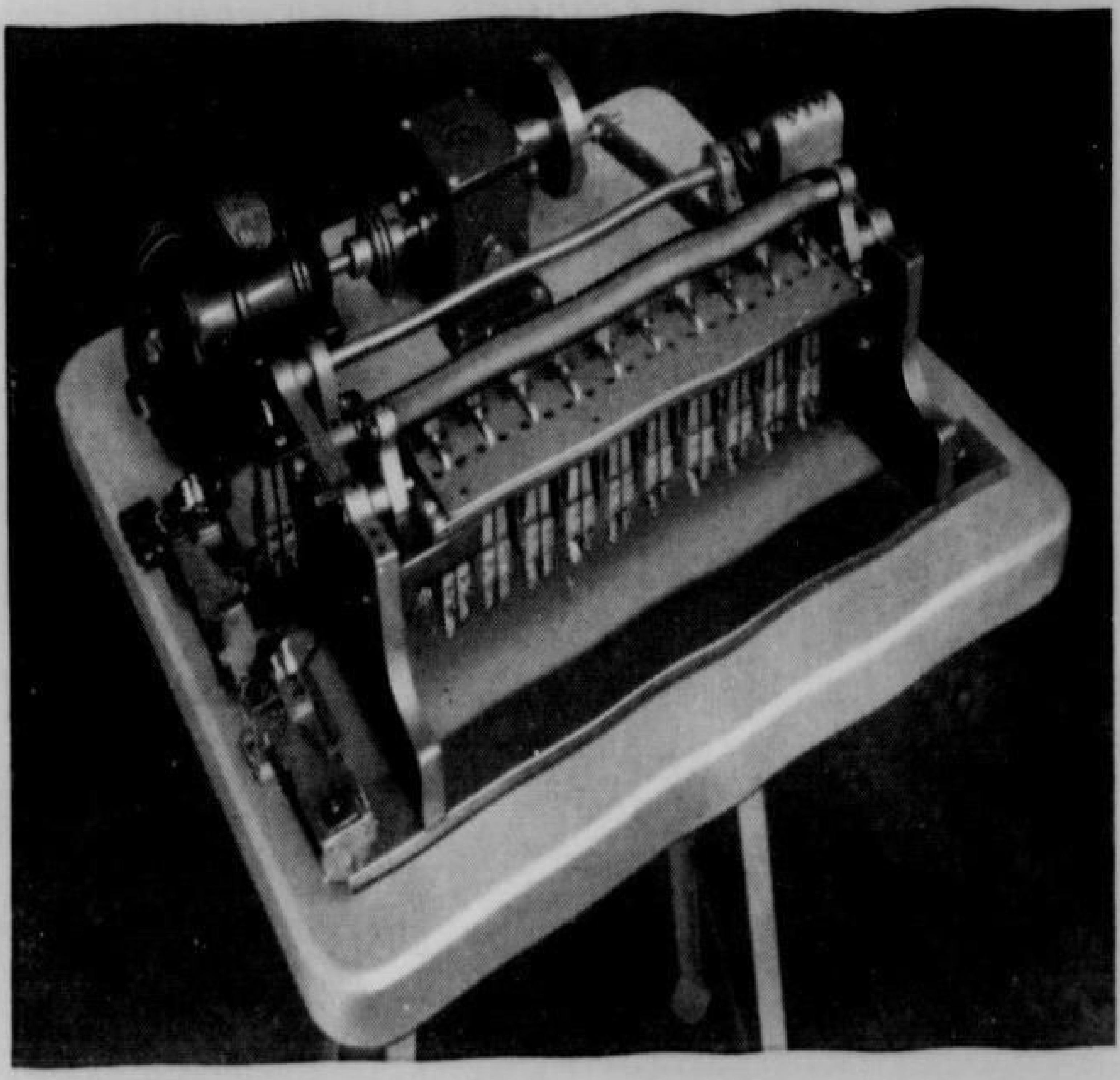
A member of the Laboratories staff is shown putting a new impulse sender through its paces.



ic properties of a tele-
rtificial voice and ear.

The Comparator, shown at right, provides a means of inspecting the contour of a piece part by projection of its outline.





Arrangement for accelerated life test of lever keys.

Strowger two-motion switches and dials under accelerated life test.

neering ventures into hitherto unexplored fields. Here are found inventions in the making, from the first rough and tentative sketches through the various processes of refinement to final operational and durability tests before release to factory production.

In this work, the project engineers in this group — the Product Design section — work closely with the production experts to insure a design which will bring the maximum in performance and durability as well as the utmost economy of production. The Product Design section also includes well equipped mechanical laboratories, in which models for new designs are built.

Still another essential phase of the Laboratories' operations is concerned with the constant checking of performance characteristics. Thorough testing and inspection of all manufactured products are, of course, integral parts of the routine factory production processes, but supplementing this is a program of constant tests not only of newly developed products, but also of sample equipment taken directly from the assembly line to insure that the prescribed standards are rigidly observed. Tests in both classes include endurance runs under conditions which are far more rigorous than those encountered in actual service, and the results of such tests are constantly being reflected in improvements which result in longer life and more dependable performance.

As has characterized all Automatic Electric progress from the earliest days, all of these activities of the Laboratories, ranging from purest research to practical design, embody the combined vision, skill and experience of many men working as a team. And, equally, each activity is eminently practical and opens up new possibilities of service improvement and economy, which year by year, are reflected in greater use and greater satisfaction.

ADVANCES IN ENGINEERING TECHNIQUES

Many elements contribute to, and are embodied in, the hundreds of Automatic Electric central office installations which today are rendering accurate, dependable and economical service throughout the world.

During the years of world expansion in the use of the Strowger Automatic system, the Automatic Electric technical staff has steadily continued its work of perfecting the apparatus, increasing its efficiency and extending its scope of usefulness. To attempt to list the many refinements they have added and are adding year after year would be fruitless, but it will be interesting to note a few of the outstanding principles of automatic telephony which they have originated and which have become permanent and accepted features of telephone service wherever automatic switching is used. Among these are automatic trunk selection, automatic intermittent ringing, revertive ringing tone, automatic busy tone, toll line dialing, party line selection, unattended rural automatic exchanges, private automatic exchanges, and interconnections in multi-office areas. They have also pioneered in the adaptation of automatic principles to the switching of toll traffic in both local areas and over long distance circuits extending through other exchanges; and also in techniques for the automatic recording and ticketing of suburban and metropolitan area toll calls.

AUTOMATIC ELECTRIC TELEPHONES

To the user of these services in all their wide varieties—the telephone subscriber—the most familiar element is his telephone instrument and its associated calling device. Automatic Electric was a pioneer in refining and perfecting this apparatus, being the first to introduce the modern molded plastic handset, which has now entirely replaced the earlier types with their separate transmitters and receivers. Today's sturdy and compact instrument is unexcelled in beauty of design, ease of handling and quality of transmission. The standard models available from all units of the Automatic Electric group include the widely used cradle-type desk set, as well as those adapted for wall or desk-side mounting, most of them being supplied as self-contained units, with the bell in the base, and plastic-molded for maximum beauty and durability. Special models to meet a wide variety of special needs and applications are also available. An essential part of each is the "whisper-quiet" Automatic Electric dial which has long set the highest standards for quietness, permanence of adjustment, long life, and trouble-free operation.

THE STROWGER AUTOMATIC SWITCH

The basic mechanism in all Strowger Automatic central office installations is a sturdy and compact electro-magnetic unit which operates under the control of the subscriber's dial with a degree of speed, precision, accuracy and uniformity unequalled by any other type of apparatus. Hundreds of Strowger Automatic exchanges operating in all parts of the world testify to its dependability, long life, and low maintenance cost. A complete unit within itself, it is mechanically independent of all other switches, and requires no power driven shafting or other mechanical linkage, with its ever-present danger of incapacitating large groups of lines.

Strowger switches may be grouped to serve small or large switching centers with equal ease and complete flexibility, and may therefore be concentrated at a single central point to serve many thousands of stations in the heart of a densely populated section, or conversely, with equal efficiency and economy, can be dispersed in a number of smaller units. Thus the same basic equipment is not only used for both small and large offices, but can also be arranged to take full advantage of the most economic type of plant distribution. Switch quantities can also be readily increased or the switches themselves readily shifted from one part of an exchange to another as changes in traffic may require.

DEVELOPMENTS IN SMALL AUTOMATIC EXCHANGES

This same flexibility of the basic Strowger switch made possible one of Automatic Electric's most original and outstanding contributions to telephone exchange operation —the development of unattended automatic exchanges for small villages and rural areas. The first unattended Strowger Automatic units—known as Community Automatic Ex-

Modern Telephones for Every Need

IN these efficient handset telephones, Automatic Electric has combined beauty and convenience of design with transmission performance that meets the highest standards of volume and fidelity over both local and long distance circuits. Here are examples of modern design from Automatic Electric plants in both hemispheres.

Type 40 Desk Monophone

ATEAphone Type 50

changes—were developed as early as 1916 for service in rural exchanges operated by Independent telephone companies in the United States. Since then thousands of similar exchanges, varying in size from a dozen or so lines to several hundreds have been supplied by Automatic Electric to telephone companies and administrations throughout the world.

An important advantage of the use of such units is that, whether they are installed singly or in groups, they permit elimination of all manual operating functions at such exchanges, and permit the centralization of toll, information and other similar services at convenient attended toll centers.

All such exchanges make use of special facilities to meet the conditions peculiar to small exchange operation. Such conditions may include dialing over various types of toll circuits, selective signaling of stations on multi-station lines, and the provision of high transmission standards under the difficult conditions imposed by long lines and heavy station loading.

THE PRIVATE AUTOMATIC EXCHANGE

Almost from the beginning of Strowger Automatic development, leaders of business and industry were quick to recognize the advantages of automatic telephone switchboards in meeting their needs for fast, dependable intercommunication.

The use of private automatic exchanges, based on adaptations of Strowger equipment to the needs of business organizations, began on a broad scale in 1917 and has since proceeded at an ever increasing pace. In a typical case, an installation consists of a simple automatic switchboard using standard Strowger apparatus and principles and

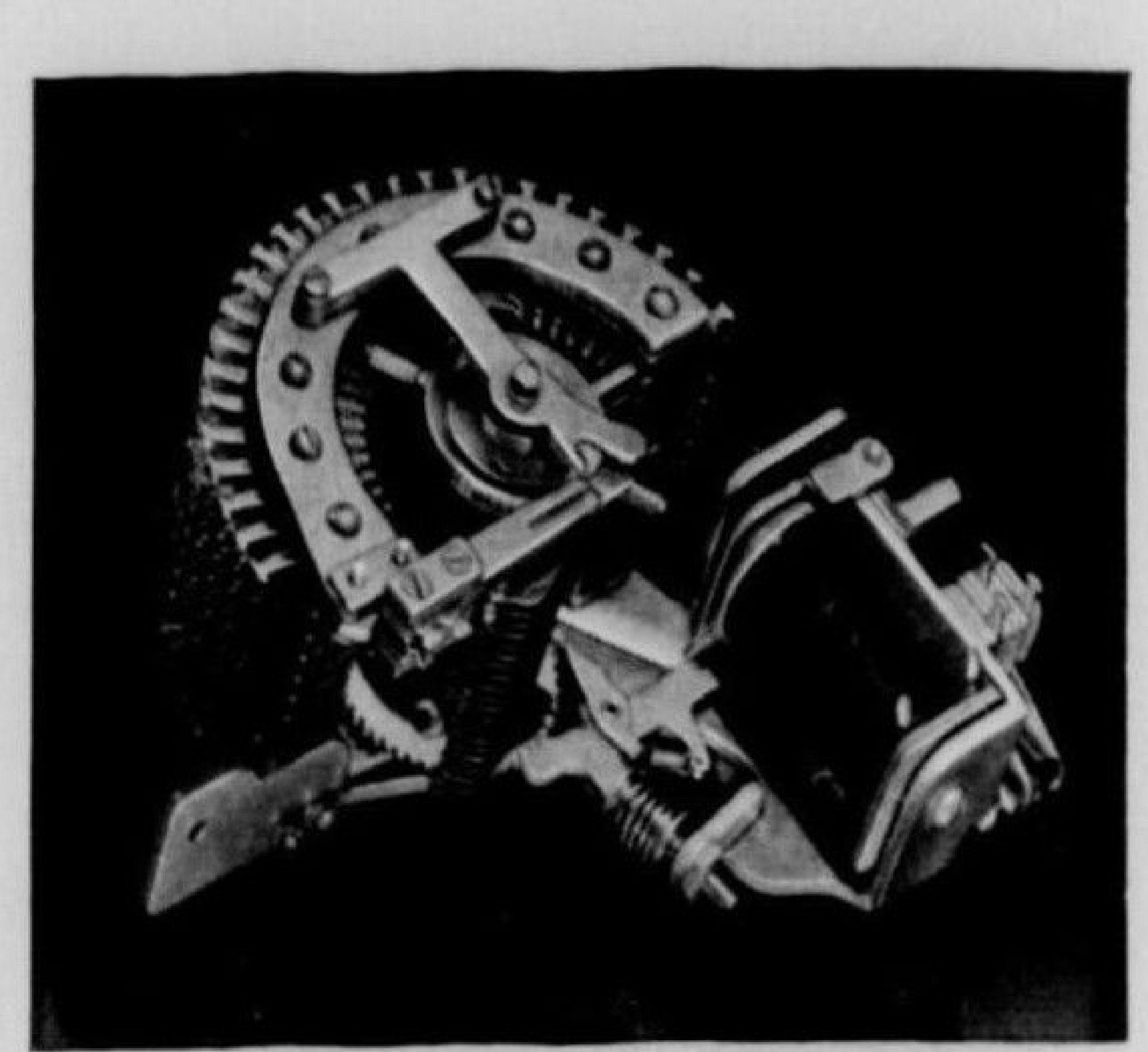
Type 47 (Three-Line) Monophone

Type 50 Wall Monophone

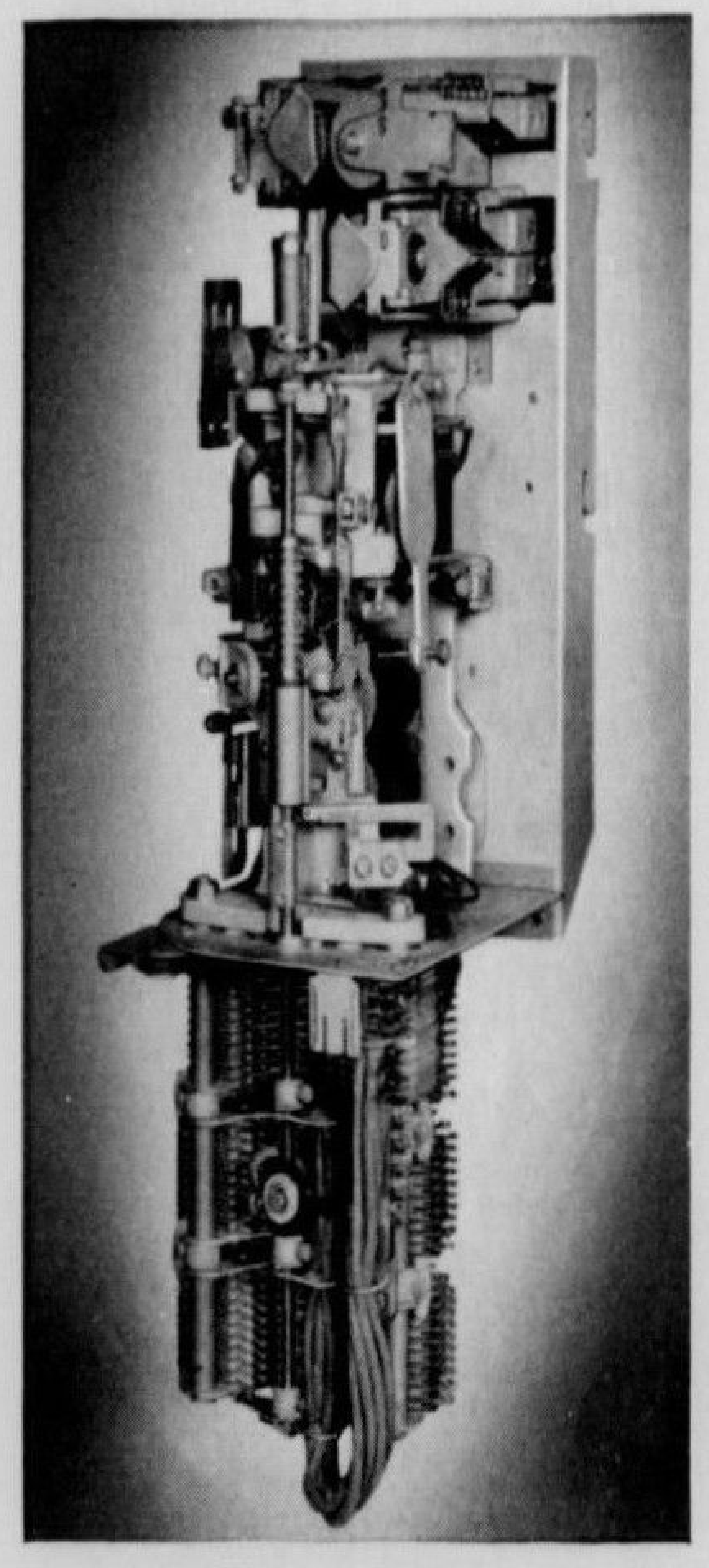
Type 43 Monophone

Typical Strowger Automatic Components

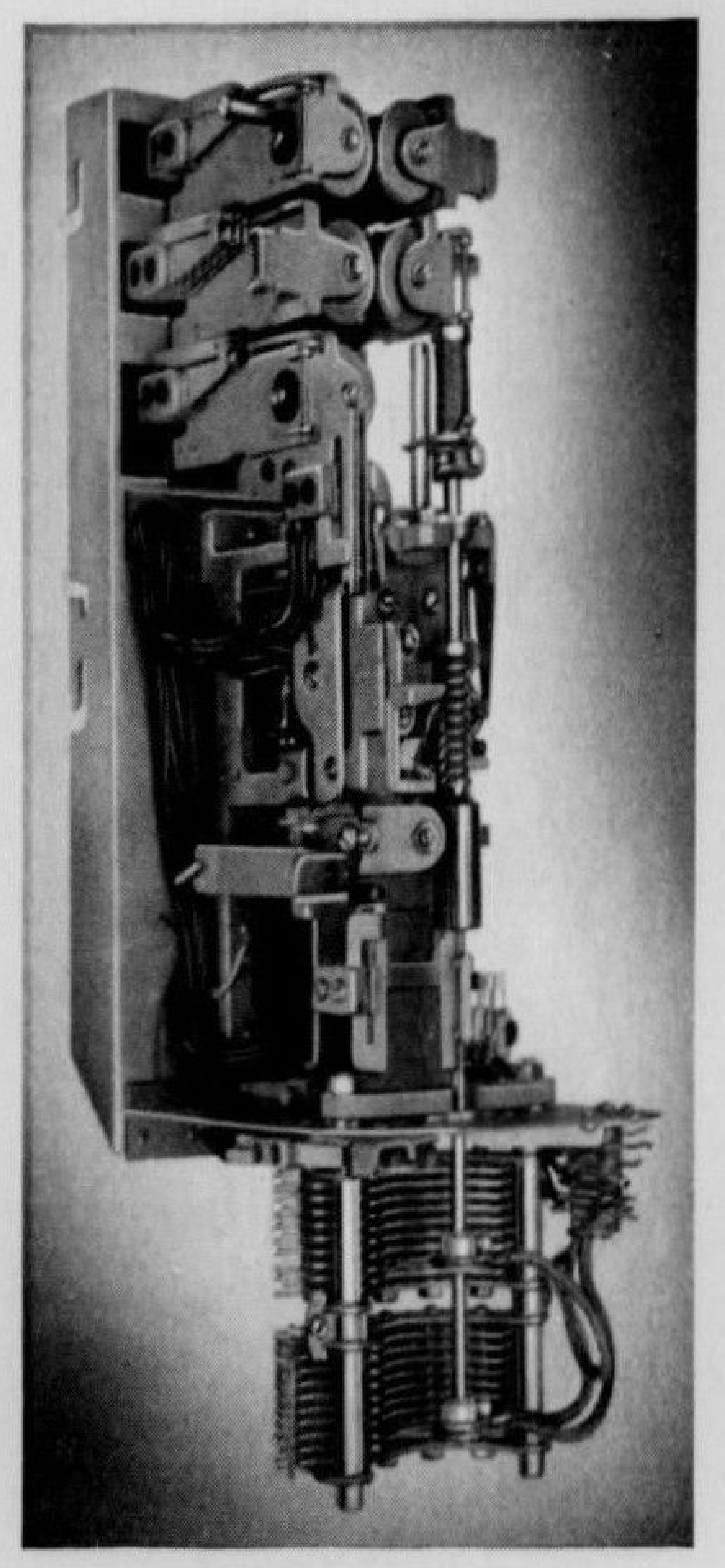
THE Strowger Switch—basic unit of the Strowger System—is at once highly standardized in principle and flexible in its application. Here are shown a few of its scores of variants, as well as a modern high-speed rotary switch.



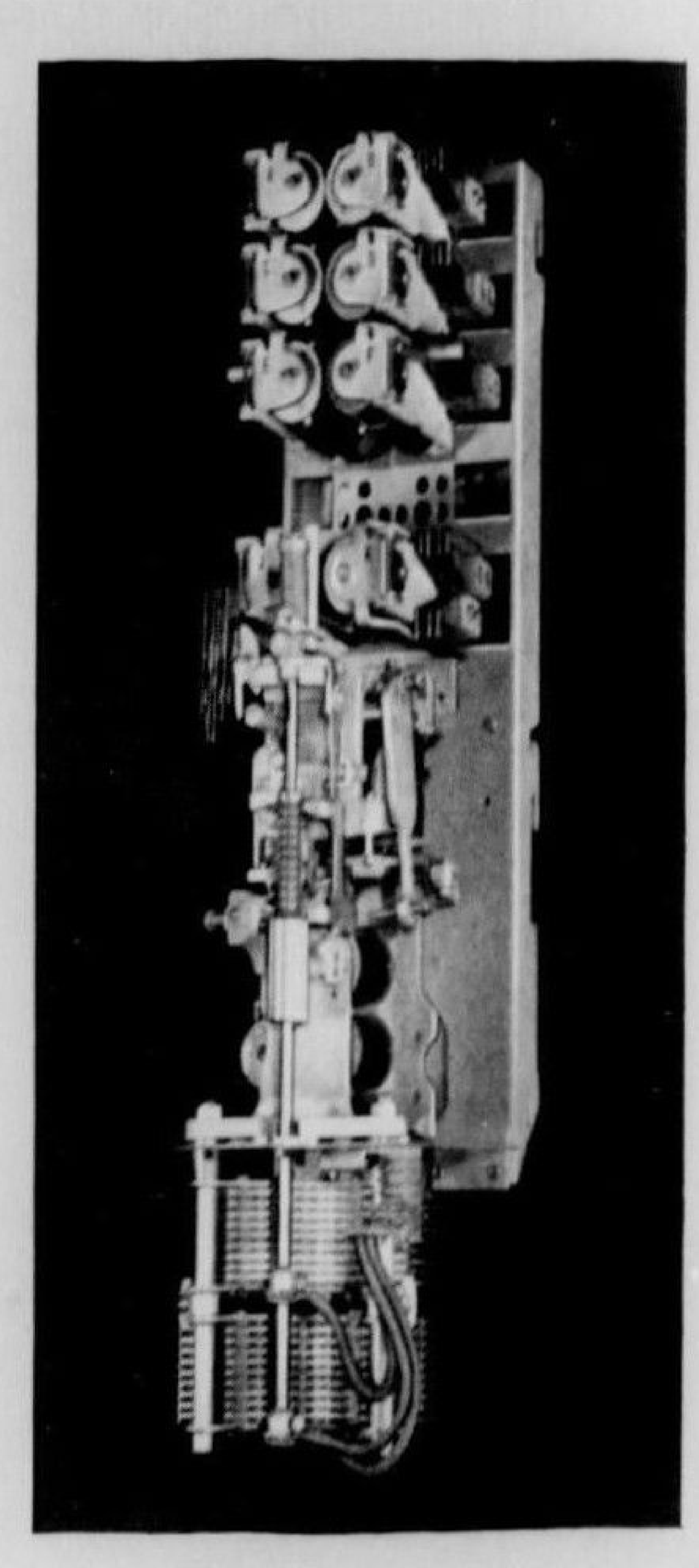
Type 45 Rotary Switch, a high speed switch used as finder or connector in small exchanges.



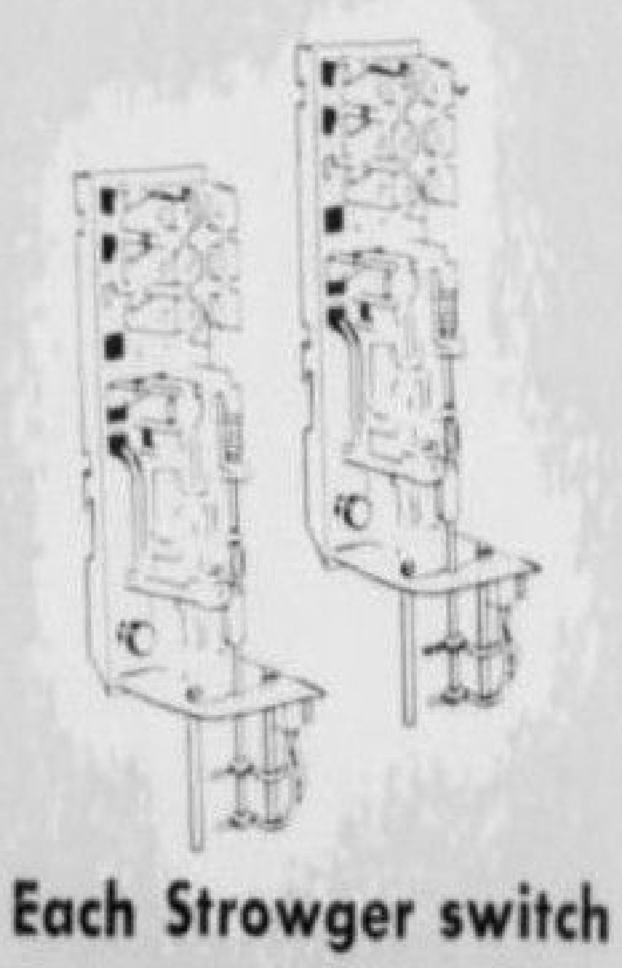
Strowger Line Finder



Strowger Selector

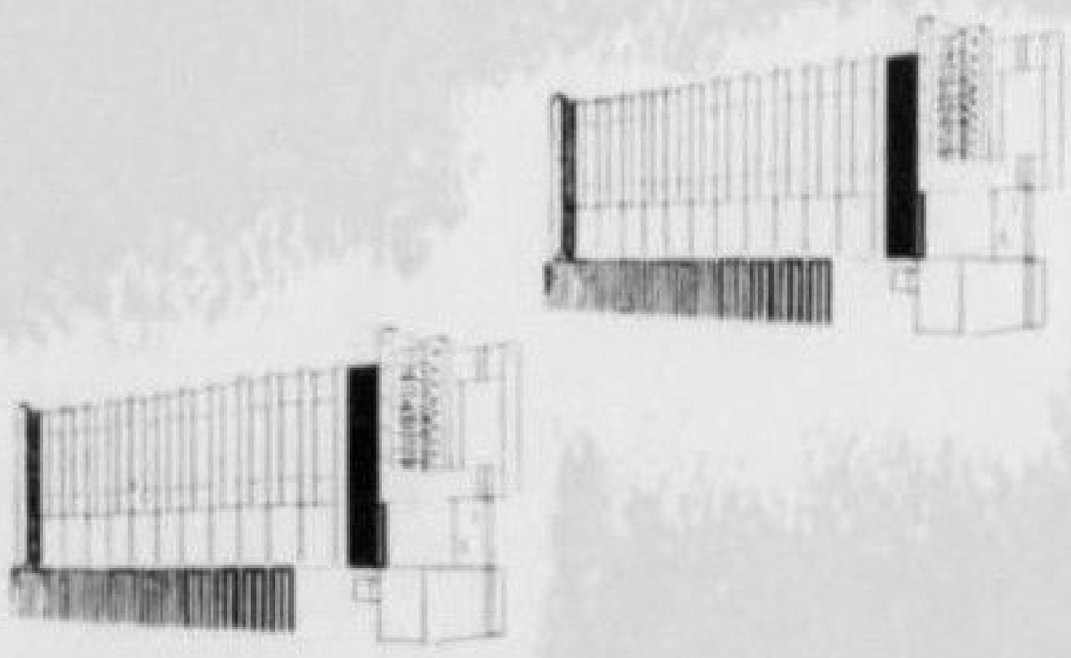


Strowger Connector

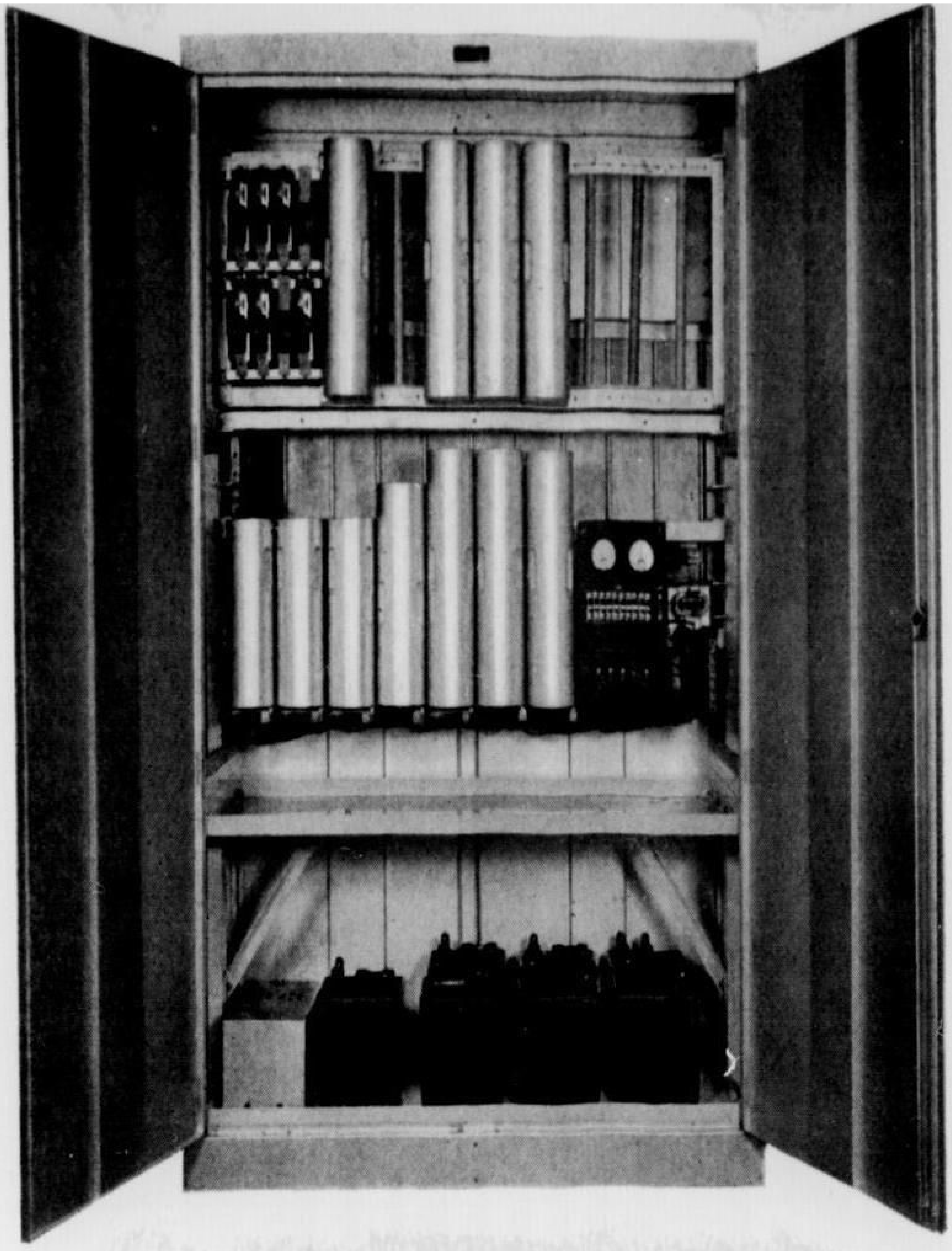


Each Strowger switch is a complete mechanism, with control relays. Wiring is terminated in a jack on the base.

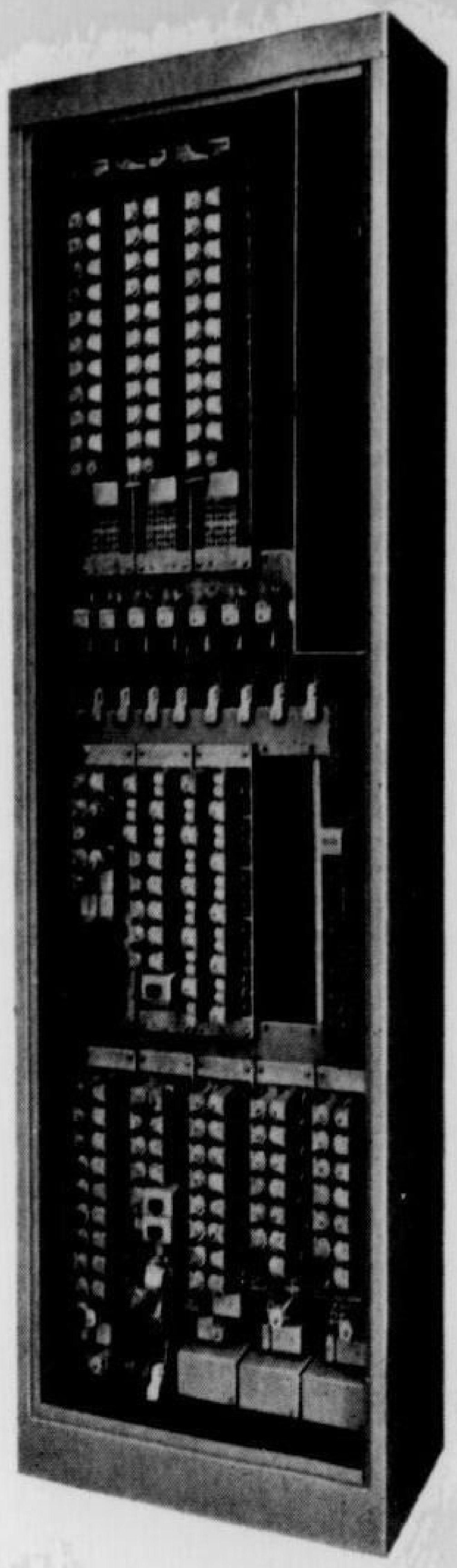
Standard shelves provide mounting facilities, complete with bank and shelf wiring and terminal blocks.



Standard frames are rigid steel structures, upon which the shelves and switches are easily mounted.



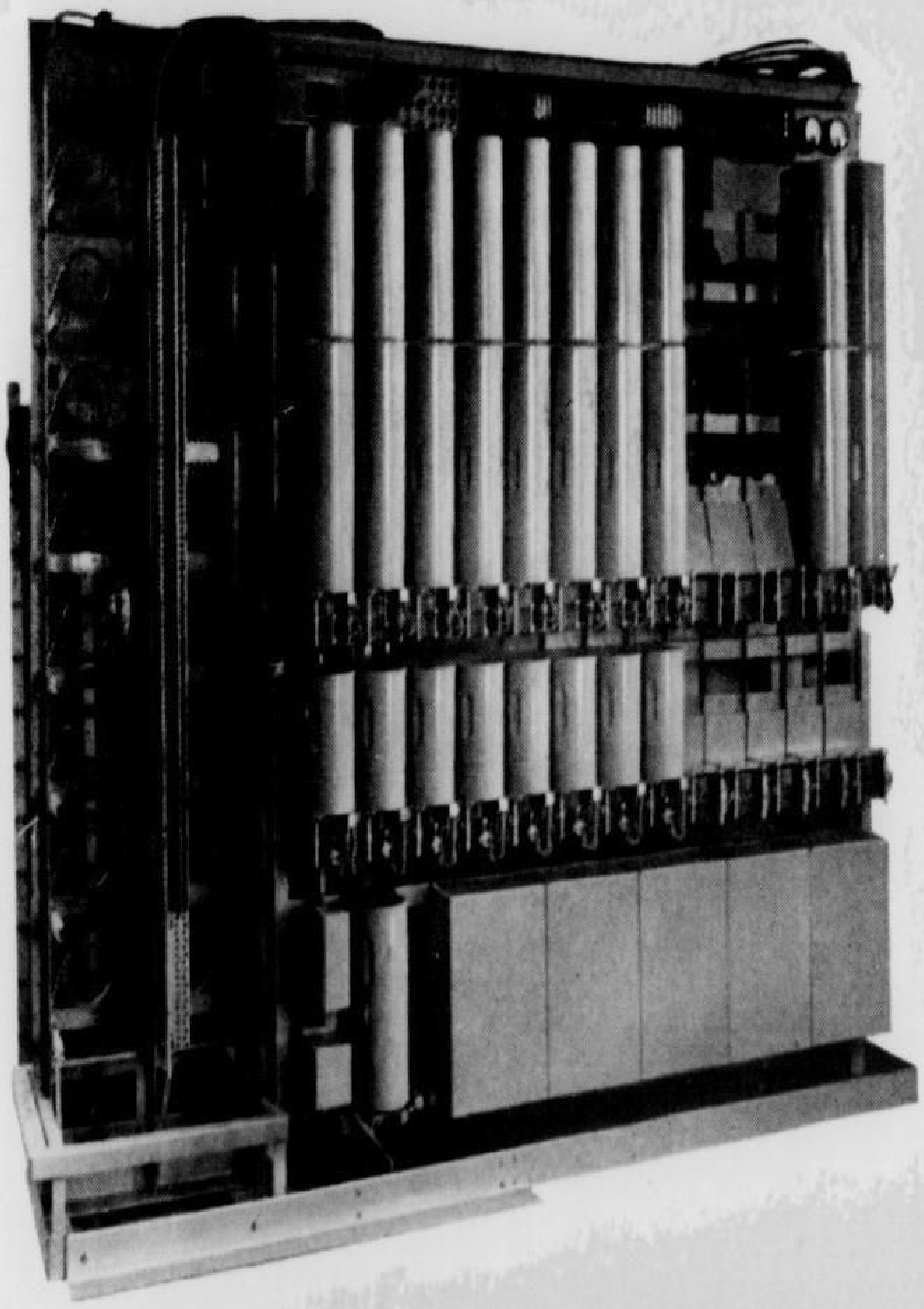
Type 46B Community Automatic Exchange (50-line capacity)



Type 48A Community Automatic Exchange (20-line capacity)

Strowger Automatic in the Small Exchange

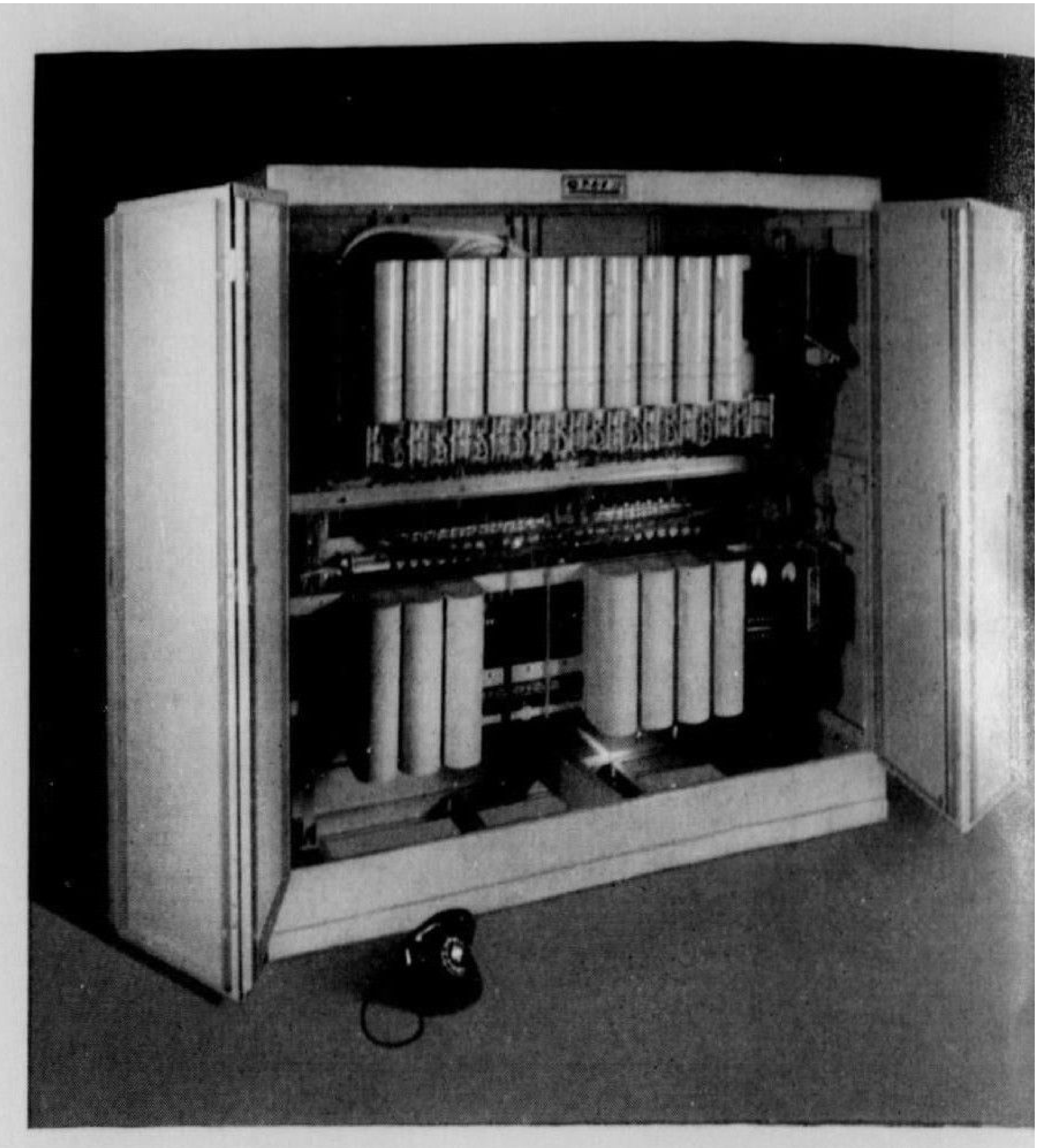
THE flexibility of small unit design has made it easy to adapt Strowger Automatic equipment to the traffic and service needs of small exchanges, and thus to bring the benefits of high standardization to administrations operating both large and small exchanges. Here are shown typical small exchange units provided by companies of the Automatic Electric group.



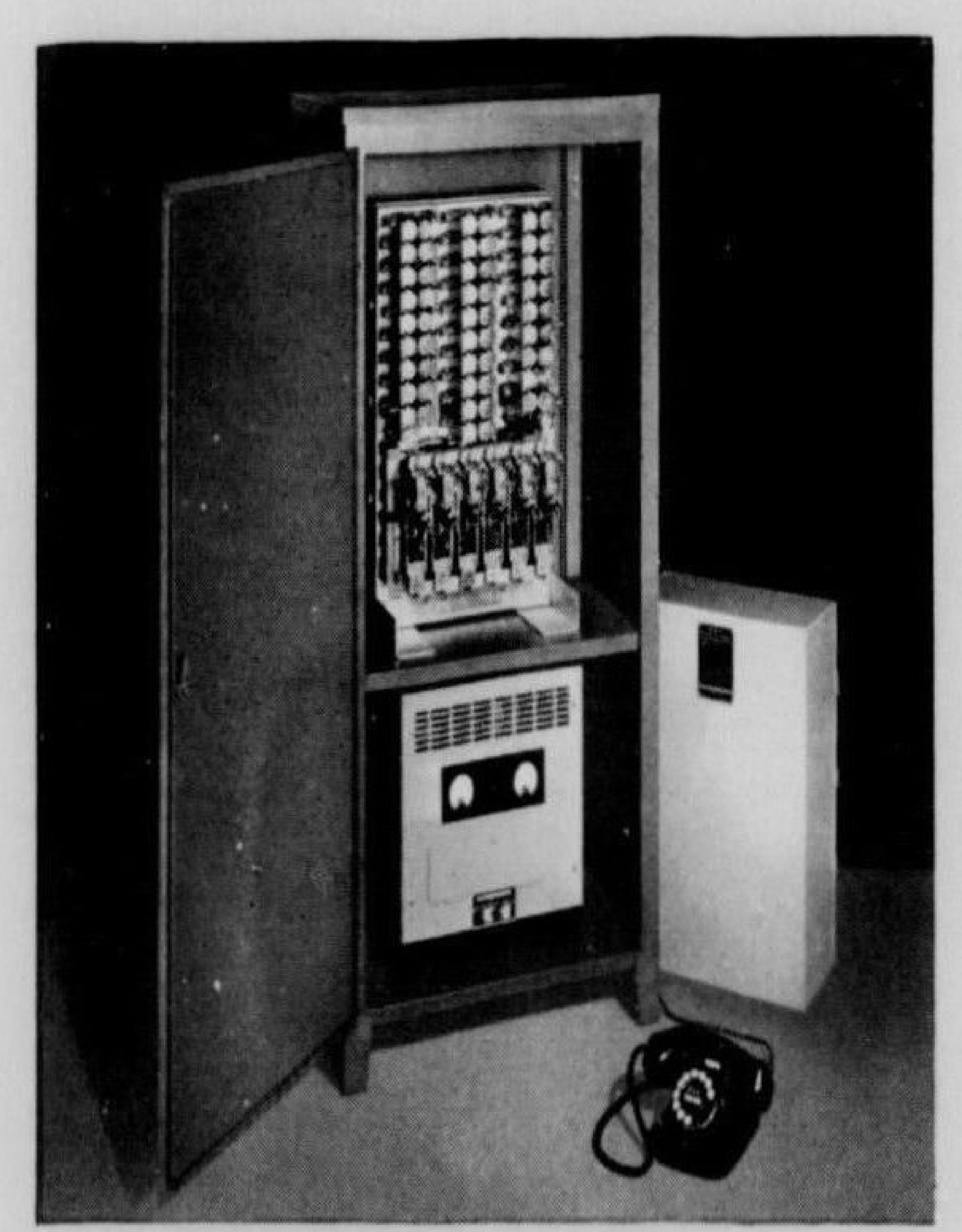
Type 10 Main Automatic Exchange For 100 lines—expansible to any ultimate.

Better Service for the Modern Business

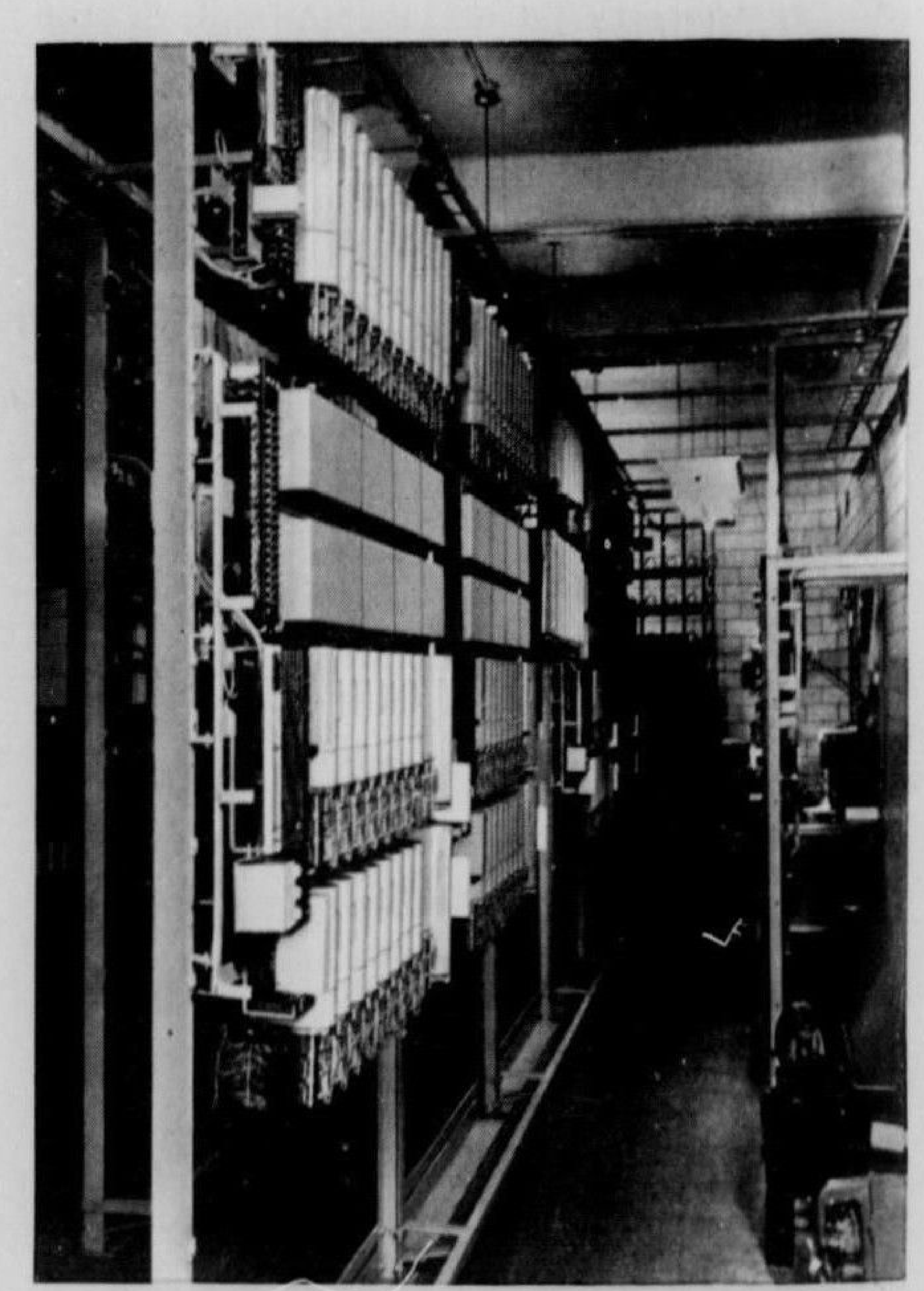
THE design and production of modern telephone equipment for business and industry has long been an important phase of Automatic Electric's activities. Such equipment embraces Private Automatic Exchange systems in various capacities and a wide variety of push button systems to meet every need.



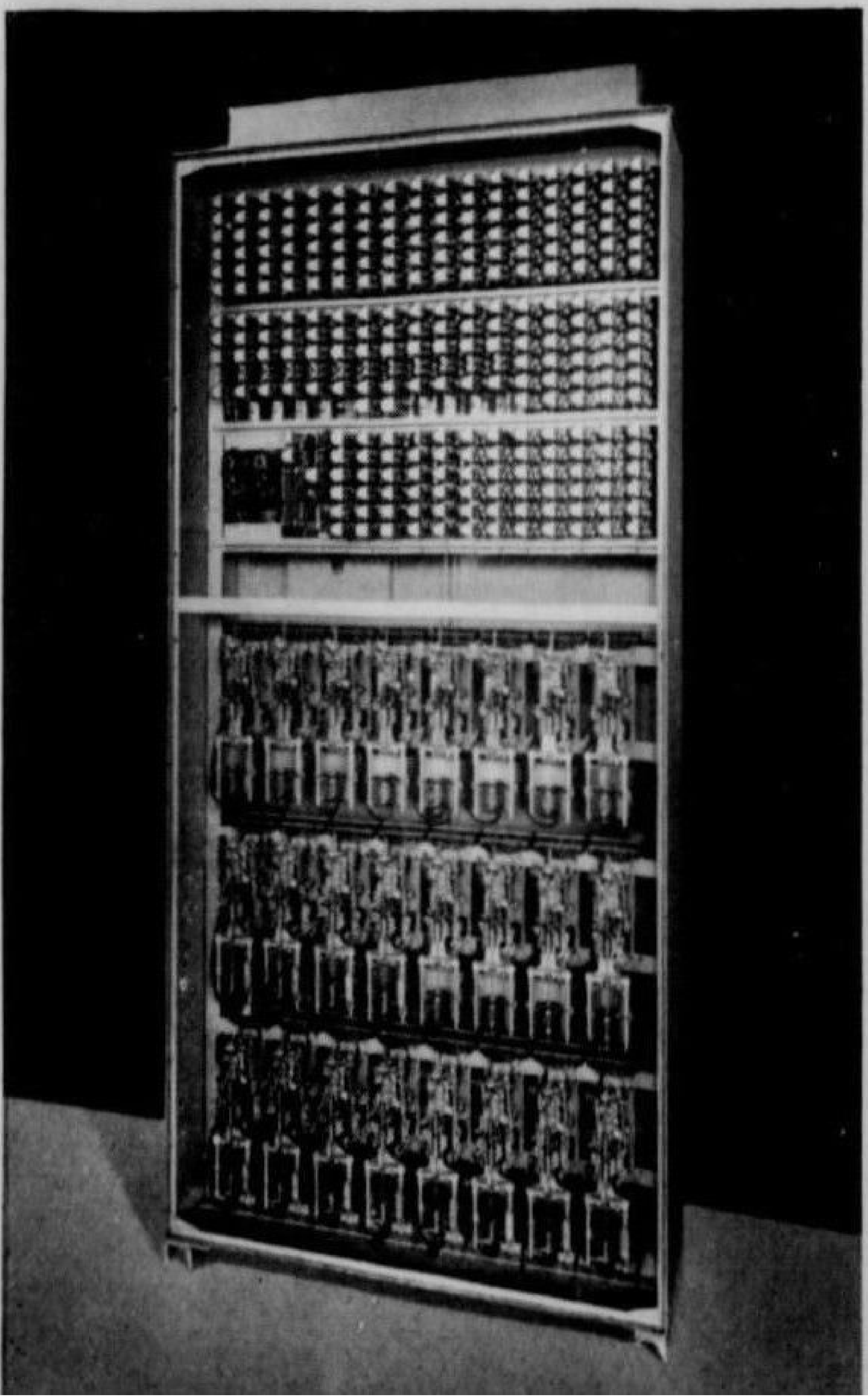
The Type 50 P-A-X System, available with or without central office trunk facilities. Normally recommended for 50 to 200 lines.



A Type 32A21 P-A-X System, for 22 lines.



For larger P-A-X Systems, Line Finder Switchboards like this are used.



An ATEA P-A-X System of 100-line capacity.

as many automatic telephones as may be needed. All internal calls are made by dialing two or three figures, with a considerable saving of time over manual methods of transmitting information between individuals and departments.

In many cases, the private automatic system is connected to the public exchange facilities and the equipment includes, in addition to the local automatic switching equipment, an attendant's switchboard for the handling of local or long distance calls to or from the public exchange. In other cases, the private automatic exchange is a separate system for internal traffic only, and is supplemented by an attended private branch exchange having connections to the central office for handling public exchange traffic. Strowger Private Automatic Exchange equipment available today embraces switchboards in a wide range of capacities, and with service features to meet every modern business and industrial need.

STROWGER AUTOMATIC IN METROPOLITAN AREAS

Further evidence of the flexibility of Strowger Automatic design is found in its extensive use in large multi-office exchanges in all parts of the world. The first city network to use multi-office trunking was that at Los Angeles, California, U.S.A., equipped by Automatic Electric in 1904. Today, a large majority of the world centers of population use Strowger Automatic equipment.

An especially significant development of Strowger Automatic techniques for metropolitan networks was the invention of the Strowger "Director"—a combination of standard Strowger components especially devised to meet the traffic and service conditions of large cities and to make full use of the economies of tandem trunking in conjunction with universal numbering and facilities for alternate routing of traffic. It was this development that was influential in the decision of the British Post Office to adopt Strowger equipment for the large and complex network of offices in the Greater London area. Conversion of this network, begun in 1924, is well advanced, and similar equipment has since been installed in a number of other multi-office exchanges in various parts of the world.

STROWGER AUTOMATIC IN TOLL SERVICE

The fast growing importance of toll service has in recent years focussed attention on the extension of automatic switching principles to toll lines, to permit the operator at an originating exchange to dial subscribers at distant points either directly or through automatic tandem exchanges. Automatic Electric pioneered the application of automatic toll dialing principles as far back as 1910, and notable examples of such applications appeared soon thereafter in both United States and Canada. These principles have since been adapted to a wide variety of toll networks in the United States and in other countries.

In their early development of toll switching techniques, Automatic Electric engineers anticipated by many years the introduction of toll dialing in networks covering wide areas, and a large proportion of the Strowger Automatic exchanges now in service have been engineered in anticipation of the ultimate needs of such wide scale toll switching plans.

Other Strowger toll switching developments which have proved their worth through actual use include Automatic (cordless) toll boards for the local or remote switching of toll circuits, and automatic toll dialing over carrier and radio circuits.

STROWGER AUTOMATIC TOLL TICKETING

The rapidly-growing adaptation of Strowger Automatic principles to toll switching soon presented another area for development. The increasing complexity of metropolitan and suburban networks and the need for greater speed on calls between exchanges made it desirable to devise means so that subscribers could dial calls to subscribers anywhere within the metropolitan area without the service of an operator.

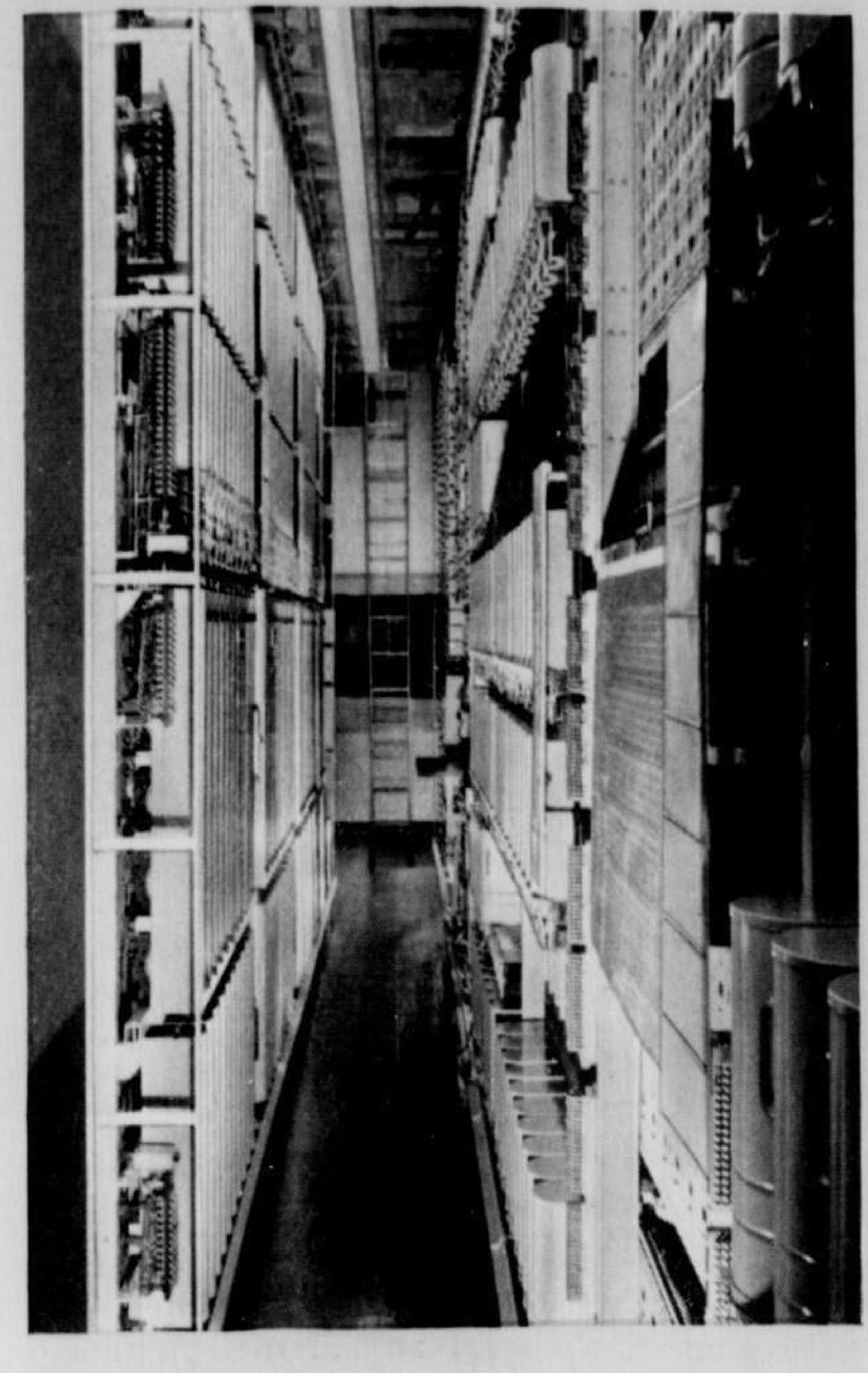
This need led to the development of the Strowger Automatic Toll Ticketing (SATT) System, which provides for the handling of suburban toll calls in the same manner as local calls, that is under subscriber control all the way. The SATT System is arranged automatically to provide a complete record of each suburban toll call for billing purposes, the recorded data including the numbers of the calling and called stations, the time and duration of the call, the unit rate, the computed charges, and all other data needed for billing and accounting purposes.

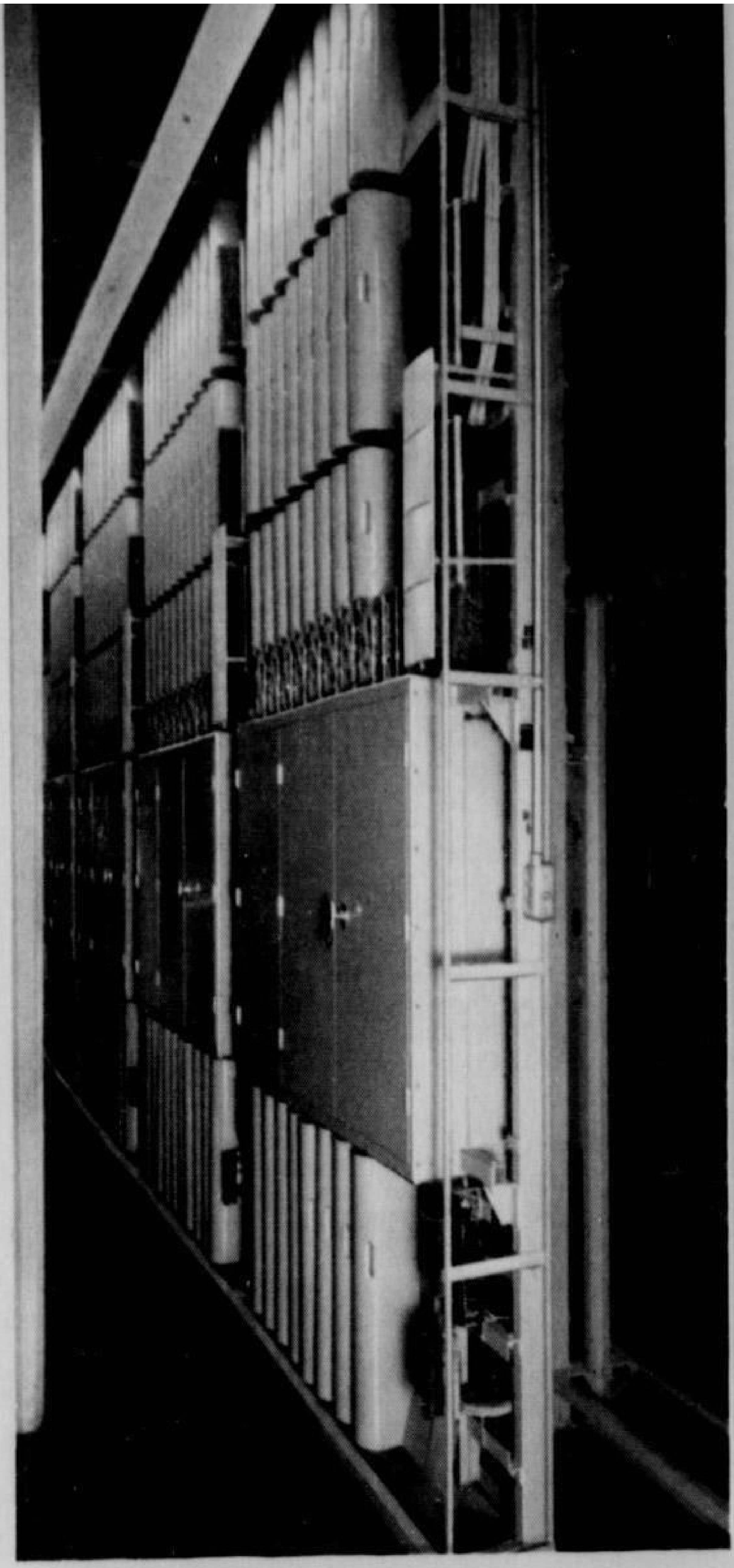
The pioneer installation of this system was made in Mons, Belgium, in 1937, by Automatique Electrique, S.A. Since then Automatic Electric has completed a number of other SATT installations in metropolitan areas in the United States and elsewhere.

ELECTRONICS IN THE TELEPHONE FIELD

While the basic principles of telephone systems have changed but little over the years, it was inevitable that the science of electronics should find widespread application in telephone service. The Automatic Electric technical staff has taken a leading position in this field, and in recent years much of its work has been directed to making the fullest possible use of electronics as a communications tool. In the main, the effect of electronic applications to telephony has been not to change the basic principles of central

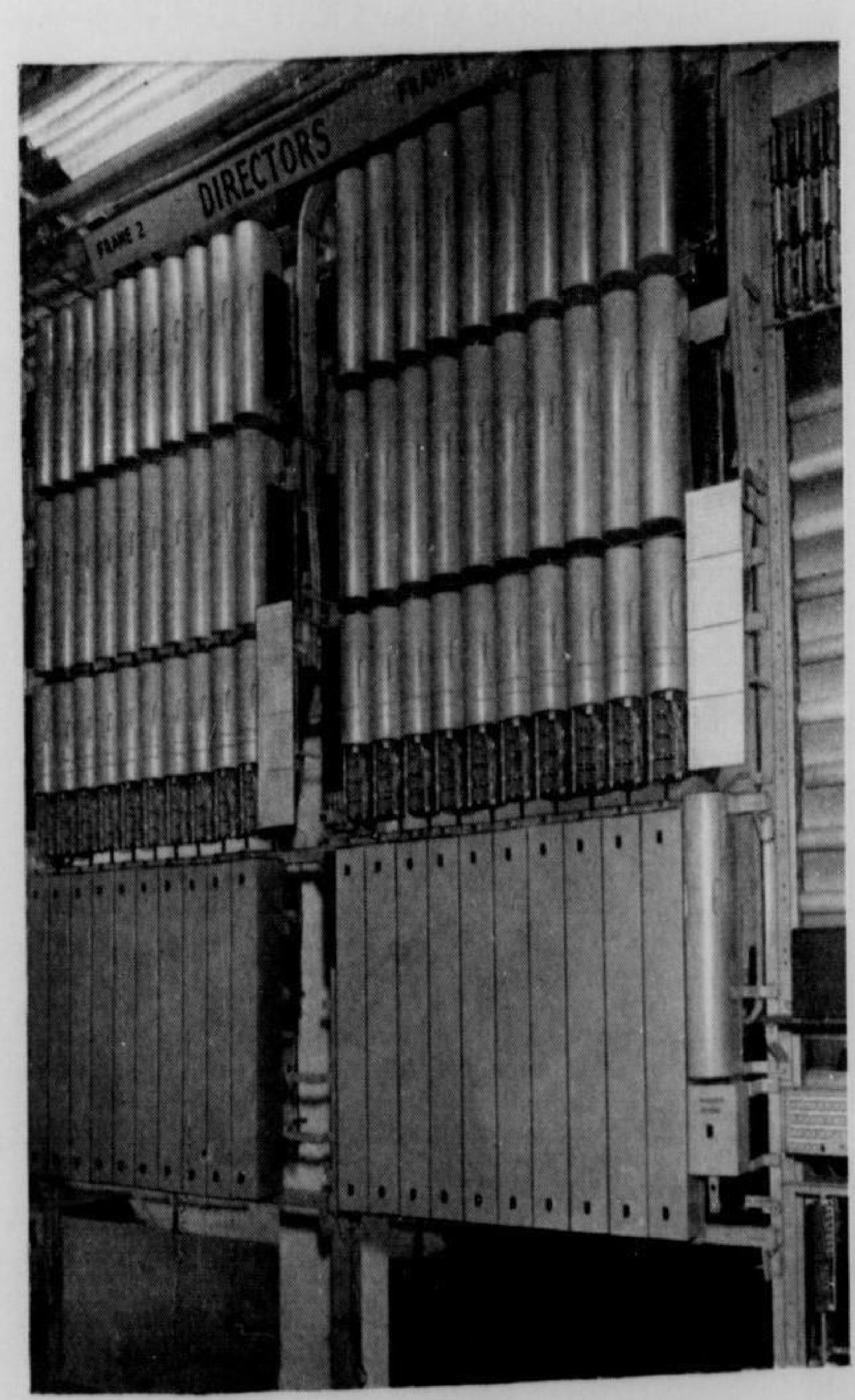
Director Frames (left) at Sunland, California.
(Sunland-Tujunga Telephone Company)





Director equipment at Park Ridge, Illinois, U.S.A.
(Middle States Telephone Company)

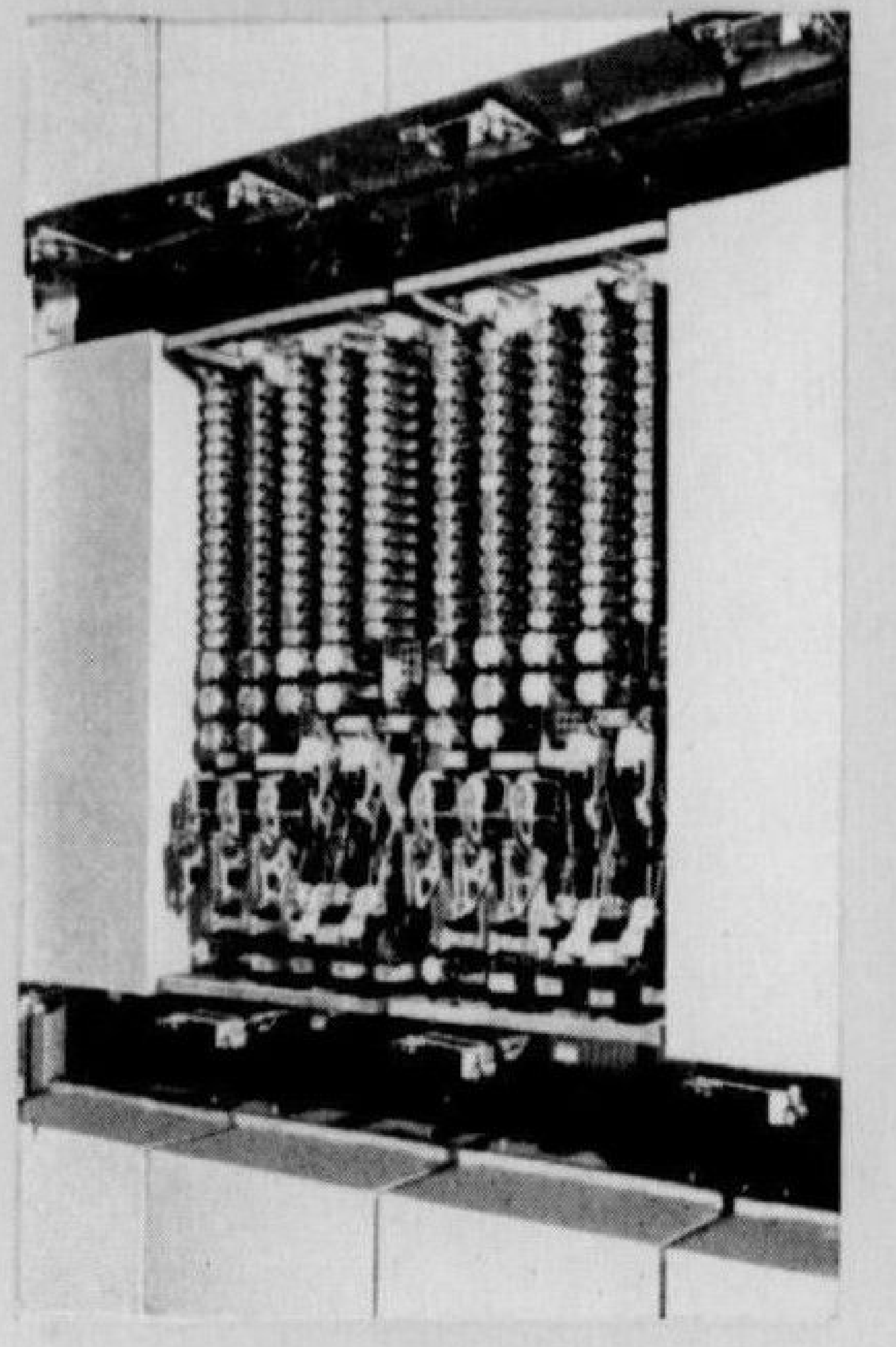
The "Director"— Magic Brain of the Modern Network

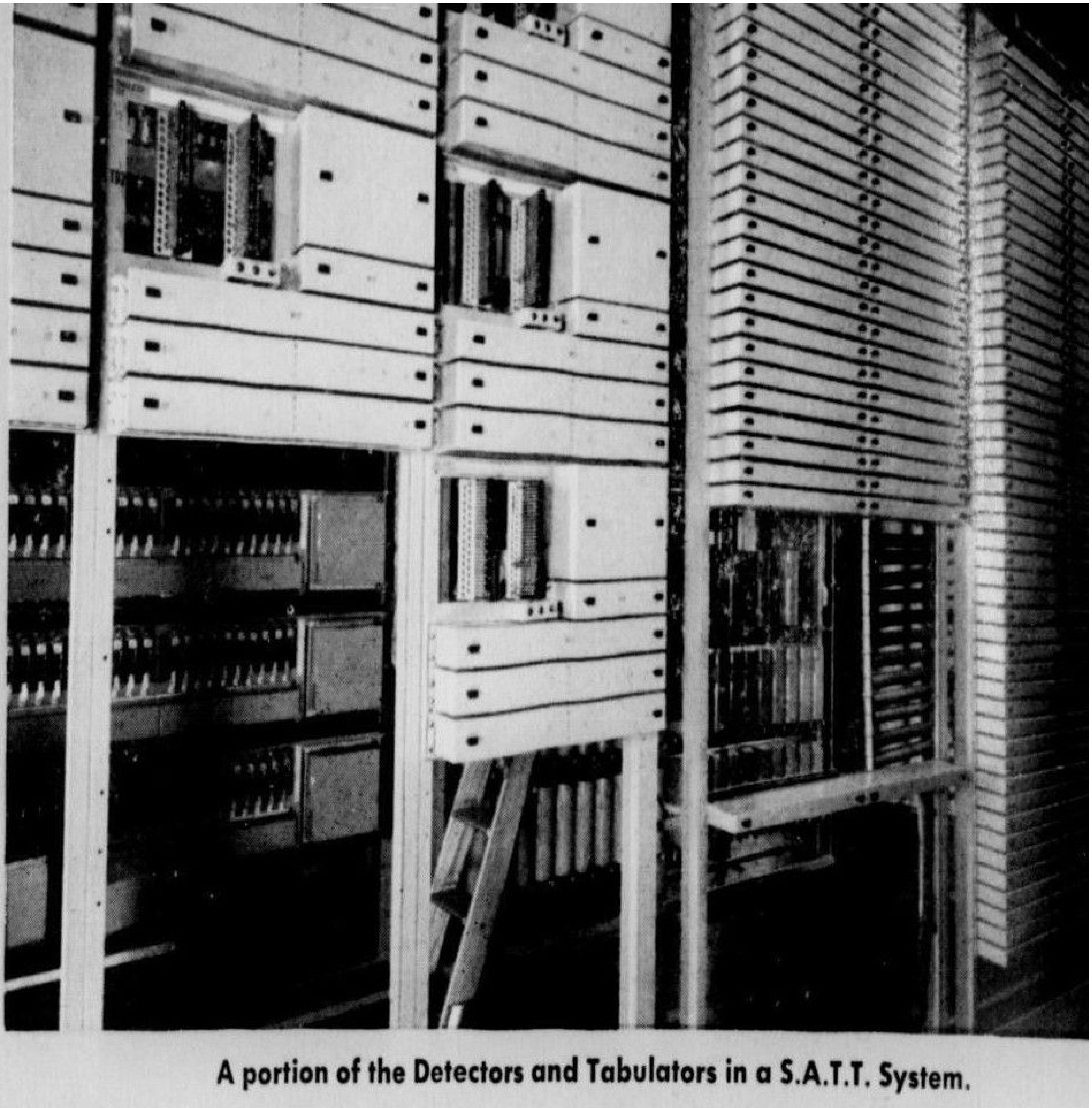


OF growing importance in metropolitan and toll telephone networks is the requirement for "digit translation" facilities to permit universal numbering with the economies of tandem trunking. In Strowger Automatic systems these facilities are provided by the Director. An important feature of this development is that it can be economically used where it is needed—even added to existing non-Director networks—or omitted where it offers no advantage.

Directors at San Fernando, California.
(California Water and Telephone Company)

S.A.T.T. Ticketer Frame, showing two ticketer details.





A portion of the Detectors and Tabulators in a S.A.T.T. System.

S.A.T.T.–For Subscriber Toll Dialing

STROWGER Automatic Toll Ticketing equipment—one of the most outstanding creations of the Automatic Electric Laboratories—permits subscriber dialing of toll calls and the automatic recording and timing of each call to provide records for billing and accounting purposes. Various units of equipment used in the S.A.T.T. System are shown here.

S.A.T.T. Tape Perforators. Tapes from these machines may be used to prepare conventional toll tickets, or used with automatic punch card billing procedures.

office switching, but rather to provide new and better ways of accomplishing ends which were heretofore subject to the limitations of wire and cable circuits.

Most widely used of all electronic applications to telephone systems is the "carrier" system, which makes it possible to transmit two or more two-way telephone conversations over a single wire (or radio) circuit. The principle involved is the application, on wire or radio telephone circuits, of "carrier" waves on which are superimposed the "voice frequency" currents of ordinary telephone conversations.

One or more such carrier waves, each of them modulated by voice currents, may be transmitted over the basic circuit and separated or "filtered out" at the distant end, thus providing for a number of simultaneous two-way conversations over plant facilities normally used for single conversations.

The equipment required consists of "carrier terminals" at each end of the circuit. Equipment of this type supplied by Automatic Electric is manufactured to rigid specifications by Lenkurt Electric Company, Inc., San Carlos, California, U.S.A., and is available in single-channel and multi-channel units for application to wire or radio circuits. The distances over which such channels operate is extended by the use of carrier repeaters at suitable intervals. Carrier terminals are also available to provide both telegraph and telephone channels and facilities for dialing or signaling to meet any combination of requirements.

Other electronic applications for which Automatic Electric supplies facilities include the following:

Mobile Radio Telephone Systems—for supplying radio-telephone service between mobile transportation units, such as motor cars and trucks and the regular public telephone exchange facilities.

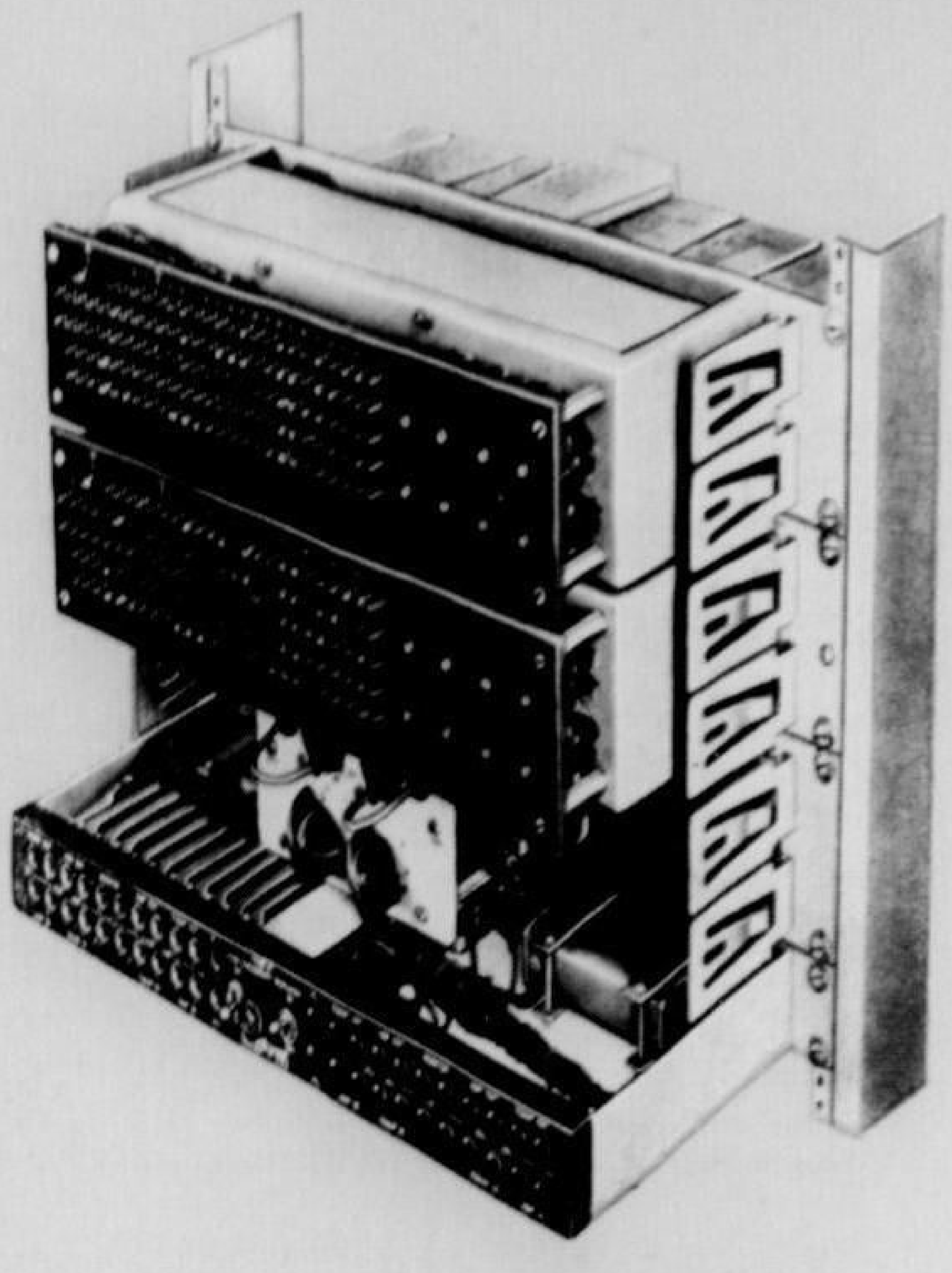
Voice Frequency Telephone Repeaters—electronic voice amplifying units for gain in transmission volume over long toll lines.

Radio-Telephone Toll Links—providing radio-telephone toll circuit facilities between points where the construction of pole line or other types of physical wire circuits is difficult or uneconomical.

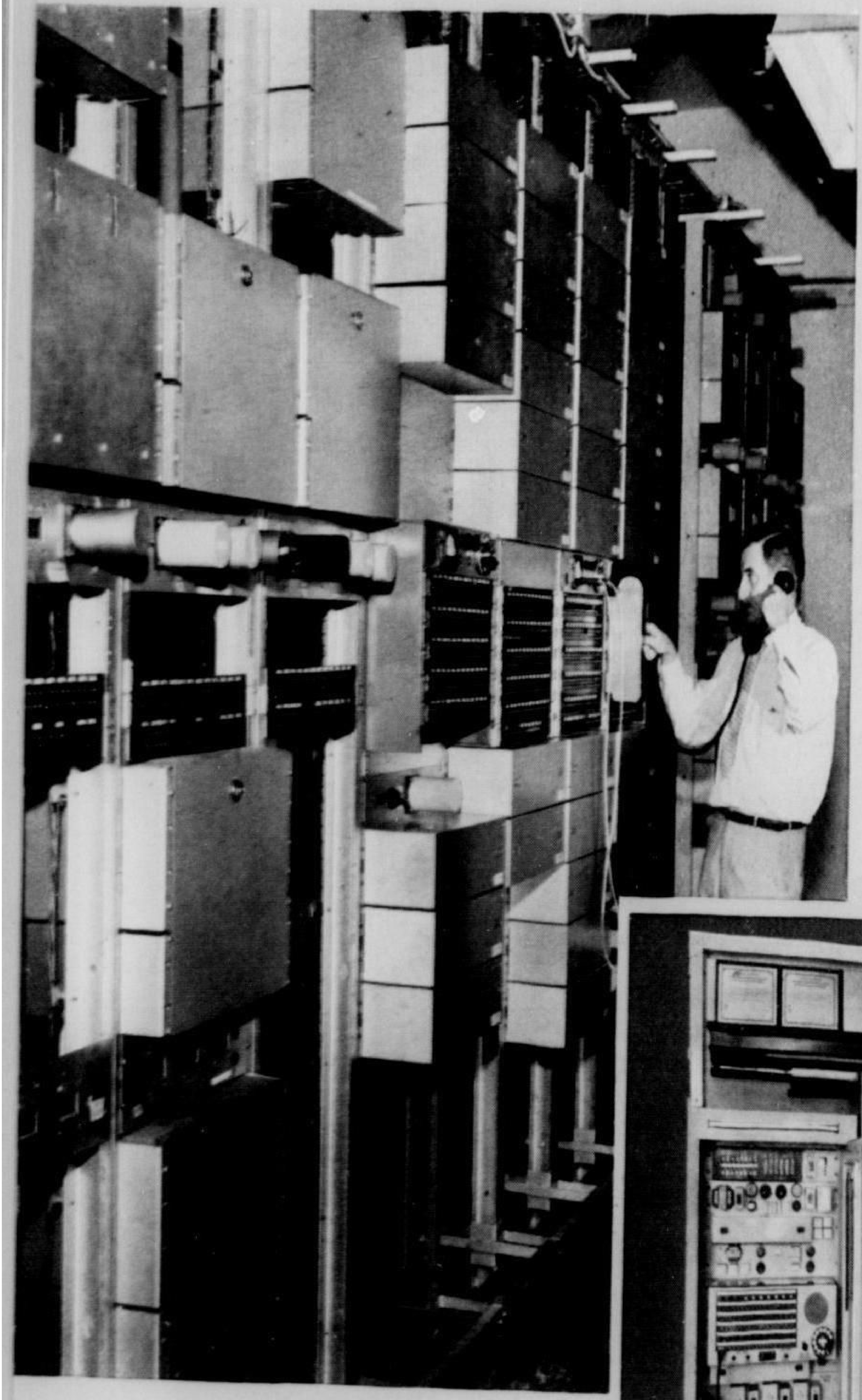
EXCHANGE ACCESSORY EQUIPMENT

It has always been Automatic Electric's policy to manufacture completely in its own shops as much as possible of the wide variety of parts and equipment that enter into a complete Strowger Automatic central office installation, and in any event to formulate its own specifications for the manufacture of parts and materials which it is not economically equipped to produce.

Electronic Telecommunications

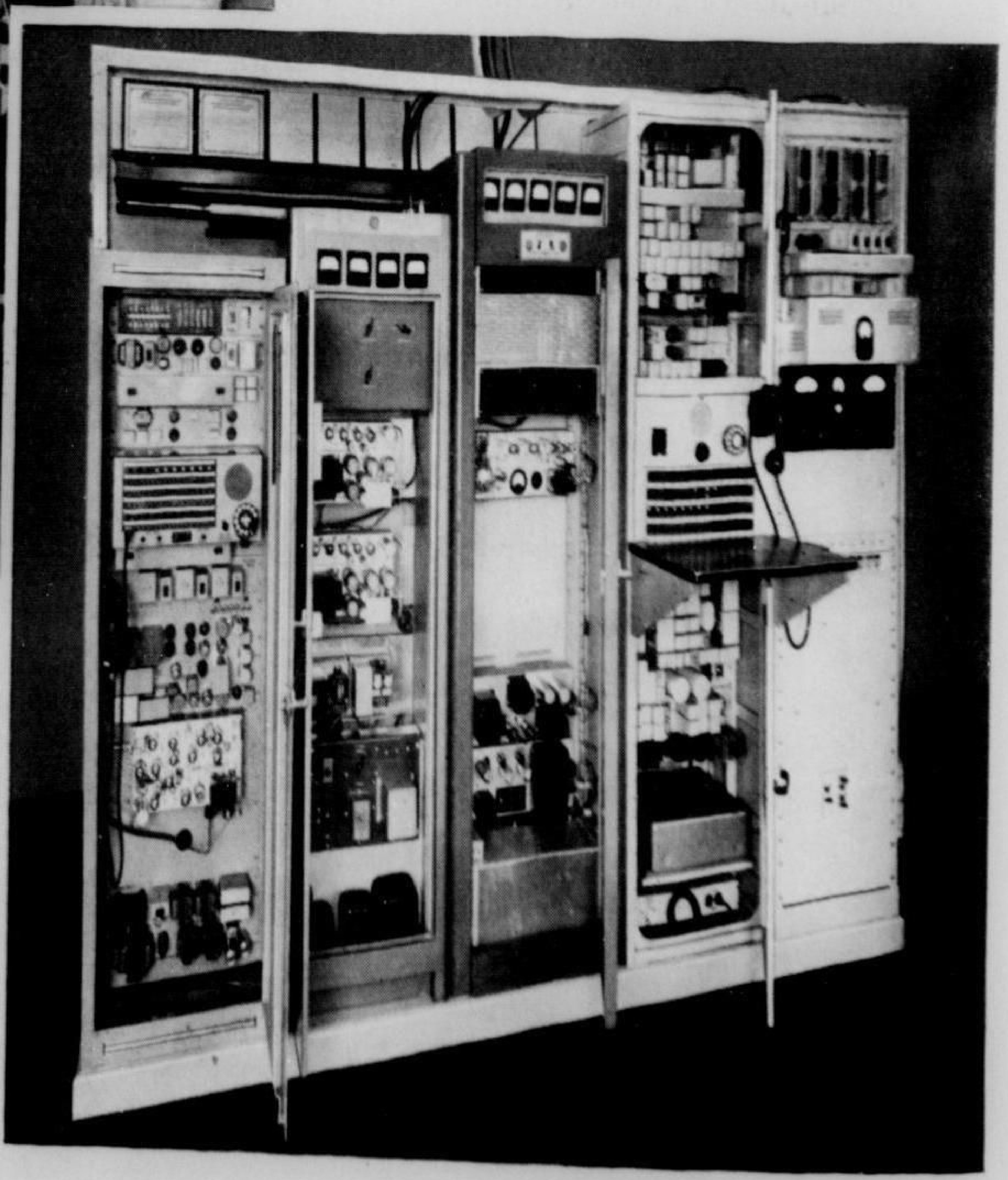


Type 47 Two-wire Intermediate Voice Frequency Repeater.



AUTOMATIC Electric has taken a leading position in the application of electronic principles to telephone switching. Here are shown typical examples of electronic equipment supplied by Automatic Electric.

Lenkurt Carrier Equipment at Honolulu, T. H.



Mobile Radio-Telephone Equipment supplied by Automatic Electric for service in Fort Wayne, Indiana, U.S.A.

A complete telephone central office will consist not only of the automatic switchboard itself, but also of a power plant (including storage battery, charging equipment and power board). There will also be such accessory equipment as distributing frames, wire chiefs' desks, test desks, toll switchboard, repair clerks' desks, information desks, and other miscellaneous equipment. All of this equipment, with the exception of storage batteries and certain types of ringing and charging machines, is made in Automatic Electric's own plants, and designed and specified by its own technical personnel. Thus each company of the group has complete control over quality of its products and their fitness for the service they are intended to perform.

Other miscellaneous telephone products manufactured by Automatic Electric include a complete range of protective equipment for central office and substation use, rectifiers and battery eliminators for noiseless power supply, paystations, telephones of standard and special types, and a wide variety of testing equipment for the efficient operation and maintenance of telephone exchanges of all sizes.

In addition, Automatic Electric, through its affiliated sales and service organizations, acts as distributor for the wide variety of materials, tools, and supplies which are used by telephone companies in the construction and maintenance of plant and central office facilities.

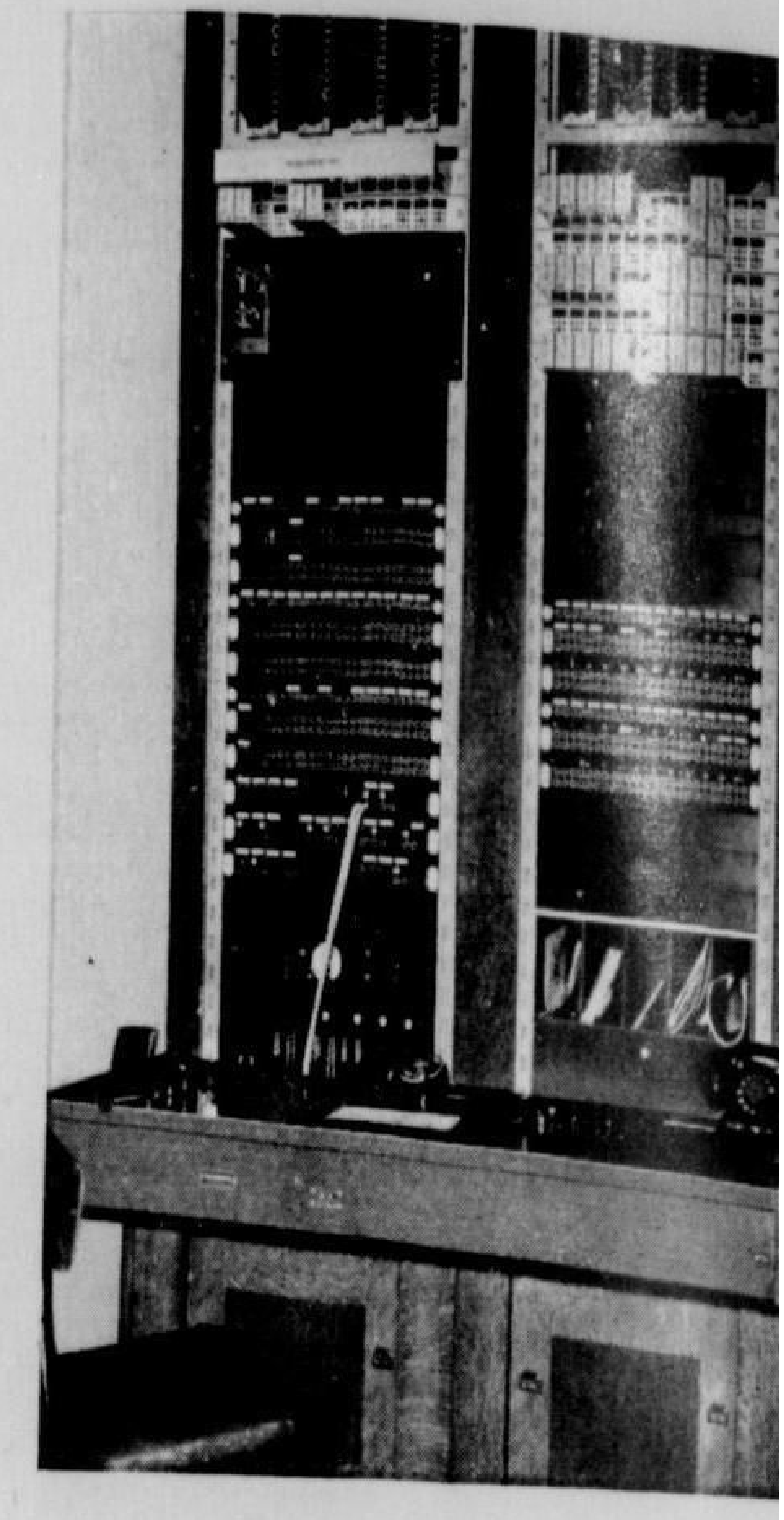
APPLICATIONS IN ELECTRICAL CONTROL

The basic principles of the Strowger Automatic switchboard and its components have found use not only in the switching of telephone lines but also in a wide variety of industrial and commercial applications in which there is need for the remote selection of electrical circuits or the remote control of circuits or functions over wires.

The Strowger Automatic Telephone System itself is the world's foremost example of the application of electrical control over wires. Through their long experience with control techniques, Automatic Electric engineers have been able to make important contributions in the adaptation of the same basic methods to other fields, either through collaboration with the manufacturers of control systems and equipment, or by undertaking complete development and manufacture of the entire equipment.

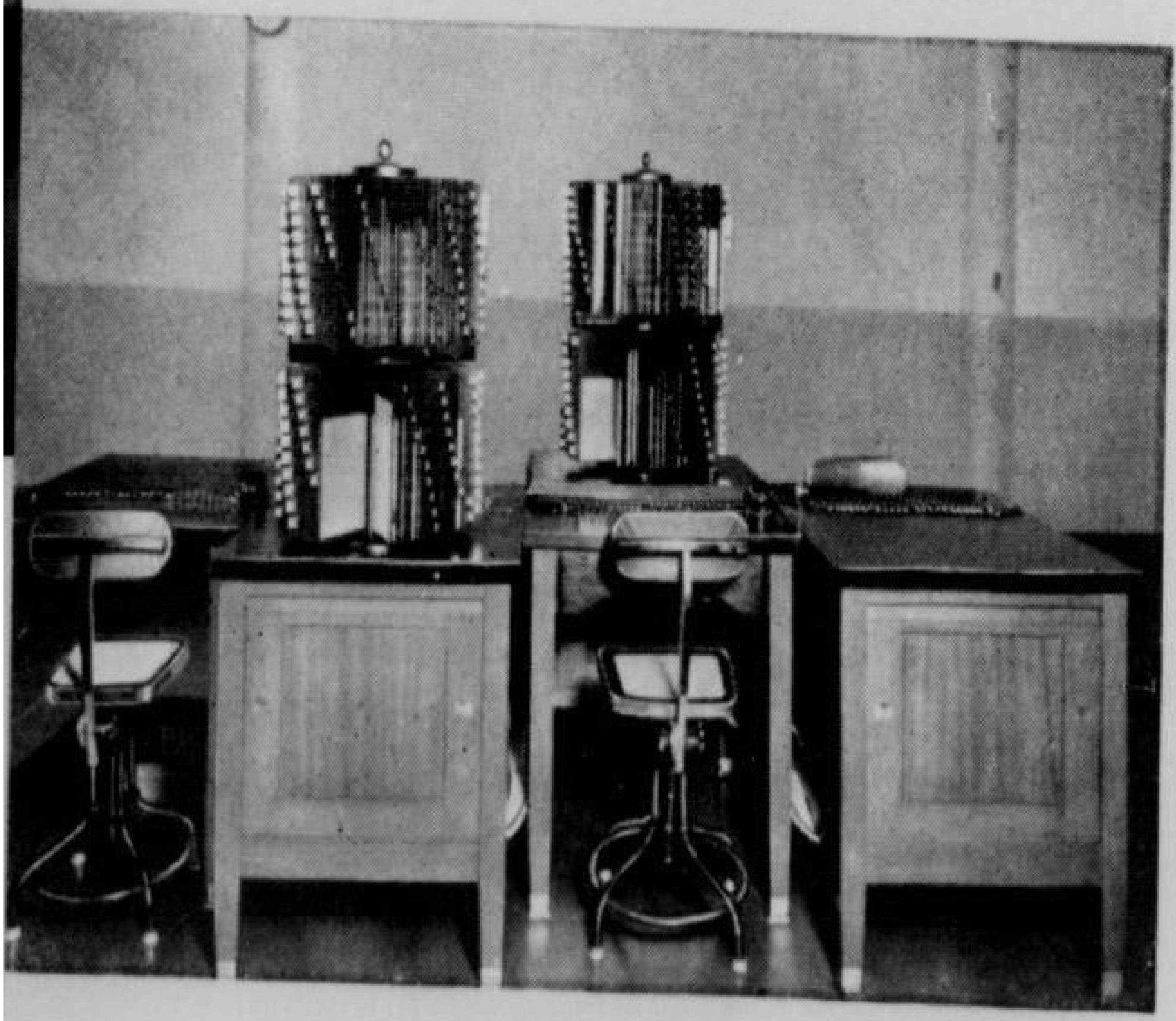
The attention of industrial engineers and designers has also been attracted to the versatility of the components of Strowger Automatic switchboards, such as relays, stepping switches, solenoids, keys, etc., and the supply of these components for use in various industrial devices forms a steadily growing part of Automatic Electric's business.

Toll and Special Service Desks for the Modern Exchange



Combined Toll and Local Test Panel.

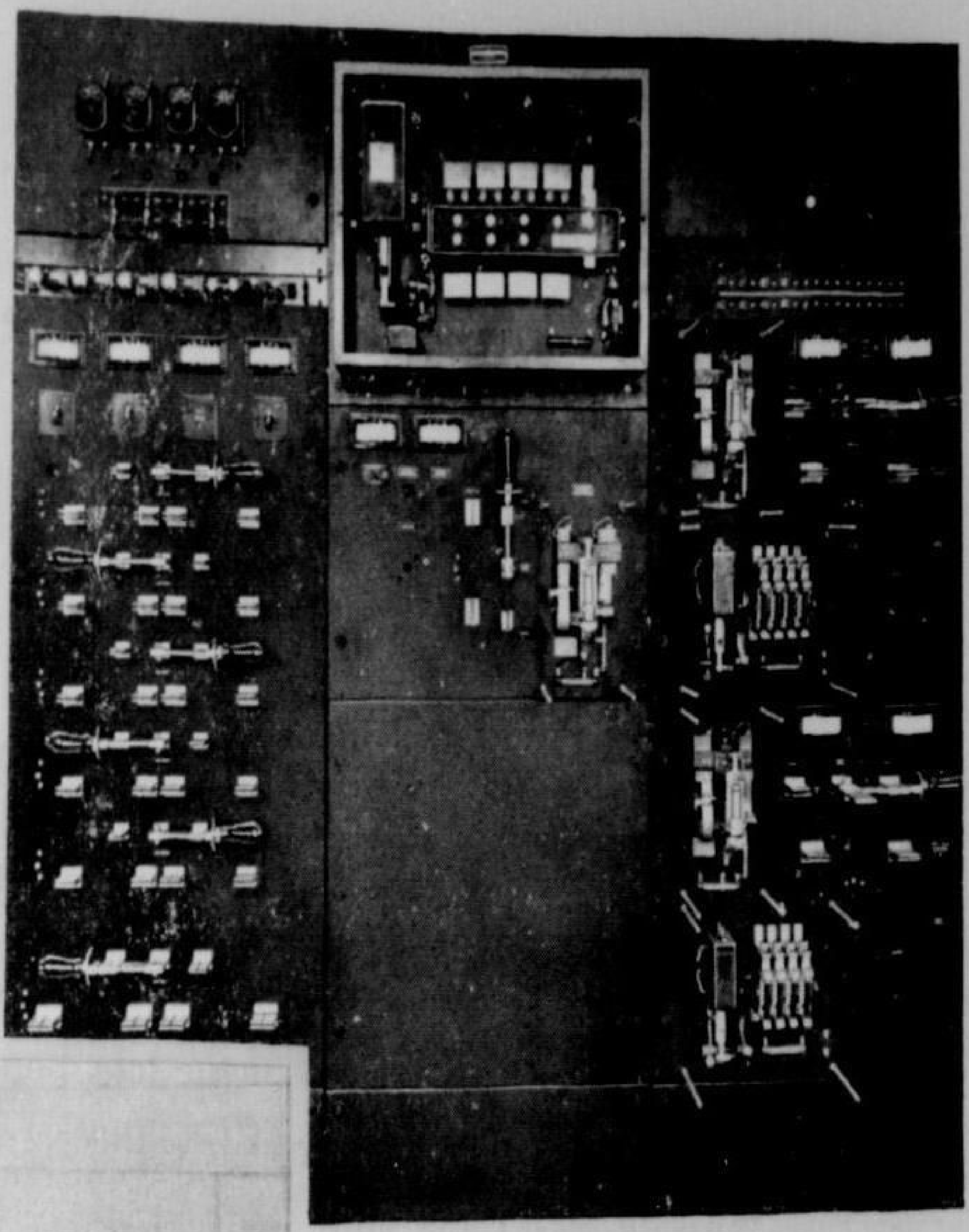
Automatic Toll Board supplied by Automatic Electric for service in São Paulo, Brazil.



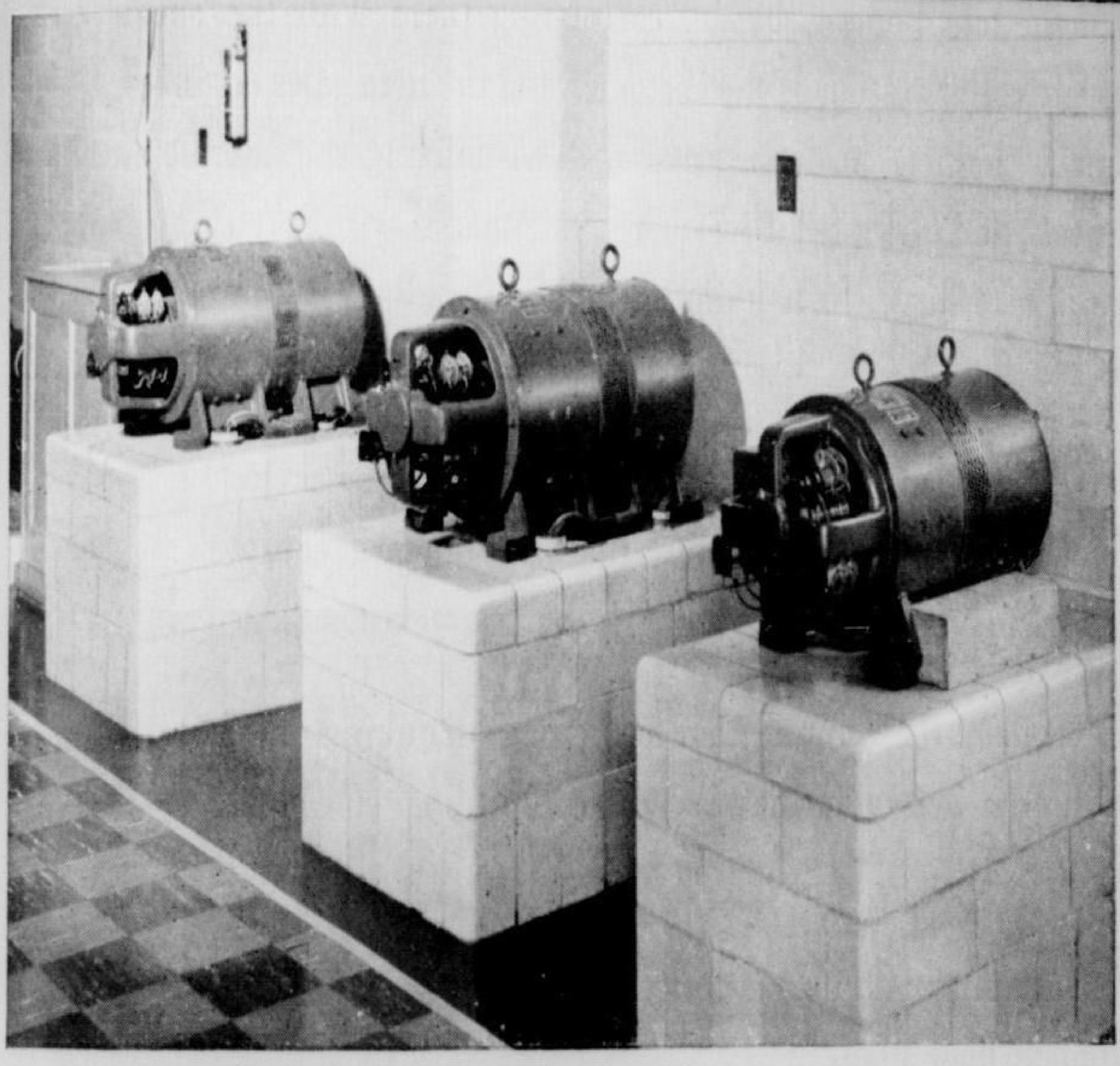
Type 3 Automatic Electric Information Desk.

Automatic Electric Dial Service "A" Board.

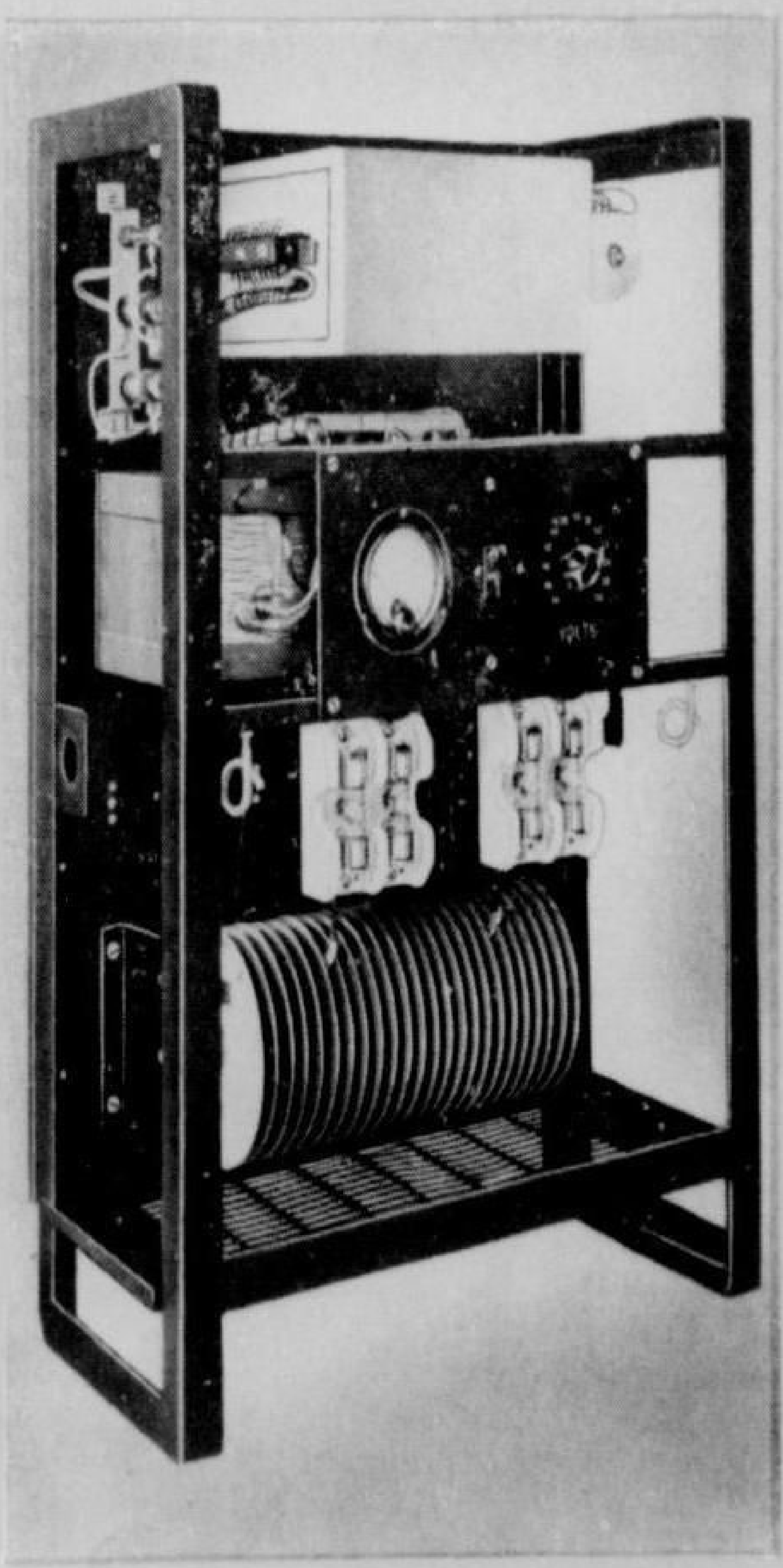
Power Equipment for Every Need



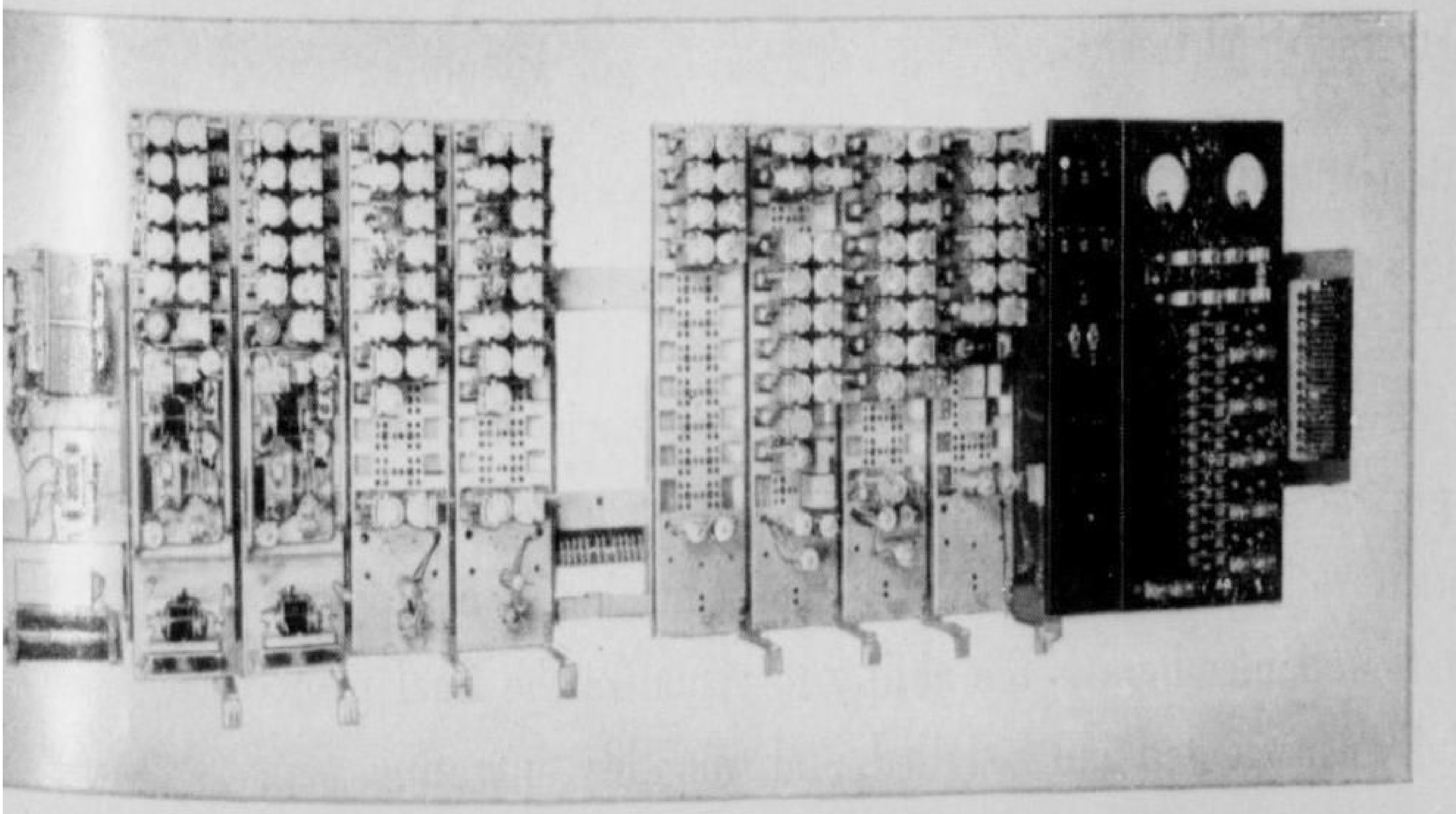
Front View of a large exchange power board.



Motor-generators as used in a large Strowger Automatic Exchange.



An Automatic Electric "Convotrol", a selenium type rectifier charger for small exchange use.



Typical "power shelf" as used in small Strowger Automatic exchanges.

BUILDING
AUTOMATIC ELECTRIC EQUIPMENT

EQUIPMENT ENGINEERING

The manufacture of Strowger Automatic telephone equipment for a central office installation begins with the work of the equipment engineer, who takes the basic ideas and apparatus which originate in the Laboratories and plans their practical application to the requirements of the telephone exchange, correlating them with the specifications worked out through collaboration of the customer and the field sales engineer. The duties of the equipment engineer are concerned with visualizing the completed installation in its broad aspects, and planning it in such detail that it will exactly meet the needs of the exchange it is to serve. In handling a typical installation, the equipment engineer is responsible for:

1. The selection of the proper switches and circuits to meet the service needs of the exchange, including such modifications of standard equipment as are needed to meet any special conditions that may exist.

2. The study of traffic data, their application to the basic trunking plan, and the computation of switch quantities to handle the traffic efficiently and economically.

3. The design of mountings and frameworks and the preparation of central office equipment floor plans.

4. The engineering of power equipment, manual desks, distributing frames and other apparatus needed for the complete exchange.

5. The preparation of complete and detailed instructions and drawings for the manufacturing departments.

6. The preparation of specifications and instructions to guide the work of the installation engineers.

The personnel of the equipment engineering department in each plant consists of highly trained and experienced telephone men, most of whom have had experience either with operating organizations or in the installation of central office equipment. An important qualification for all members is the ability to visualize the final project—soundly planned, carefully constructed and installed, and smoothly operating.

MANUFACTURING PROCESSES

The manufacture of Strowger Automatic equipment and other Automatic Electric apparatus is not a mass production process in the usual sense of that term. While the equipment produced by Automatic Electric is made up of switching units and other elements which are basically similar in design, the number and combination of such elements must differ widely for each project. Thus the equipment for each installation is "tailor-made" to individual specifications, while at the same time the economies of volume production are applied to basic parts and assemblies.

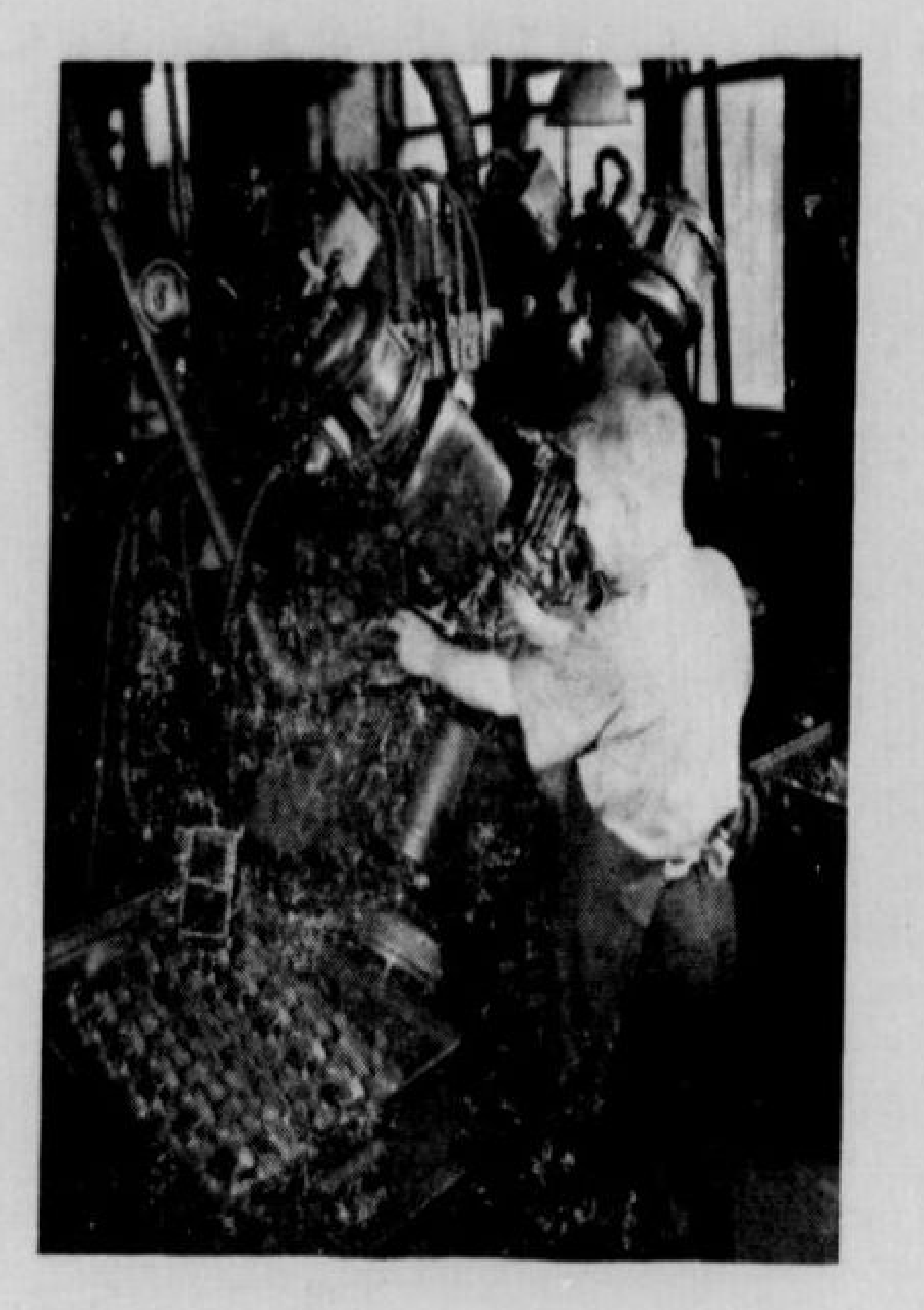
It will therefore be seen that Automatic Electric's production operations are not only exceedingly complex but also highly specialized, requiring for their maximum effectiveness a perfection of manufacturing techniques which only long continuity of organization can provide. It is significant, and of great importance to Automatic Electric's customers, that its personnel is made up predominantly of people who have had long and intimate contact with the production problems peculiar to its field. The supervisors in charge of the various departments are trained to be constantly on the alert for improved methods and materials which will add to the efficiency of manufacture, and the quality and performance of the finished product.

CONTROL OF PERFORMANCE

The products of Automatic Electric have long been recognized the world over for their high standards of performance, durability, and dependability. In the protection of this reputation, nothing is left to chance. The control of quality begins with rigid inspection and test of all raw materials and parts which come from suppliers, and continues through all stages of manufacture.

Exacting standards are established by inspection engineers, and many special tools and measuring devices are employed to insure that all parts and assemblies are processed to fall within the narrow tolerance limits required for dependable service and long life. When final assembly is complete, each item of equipment is put through actual operating tests under conditions much more severe than those encountered in practical service. The rigid standards which are set for this work are largely responsible for the reputation for dependability which Automatic Electric equipment has wherever it is used.

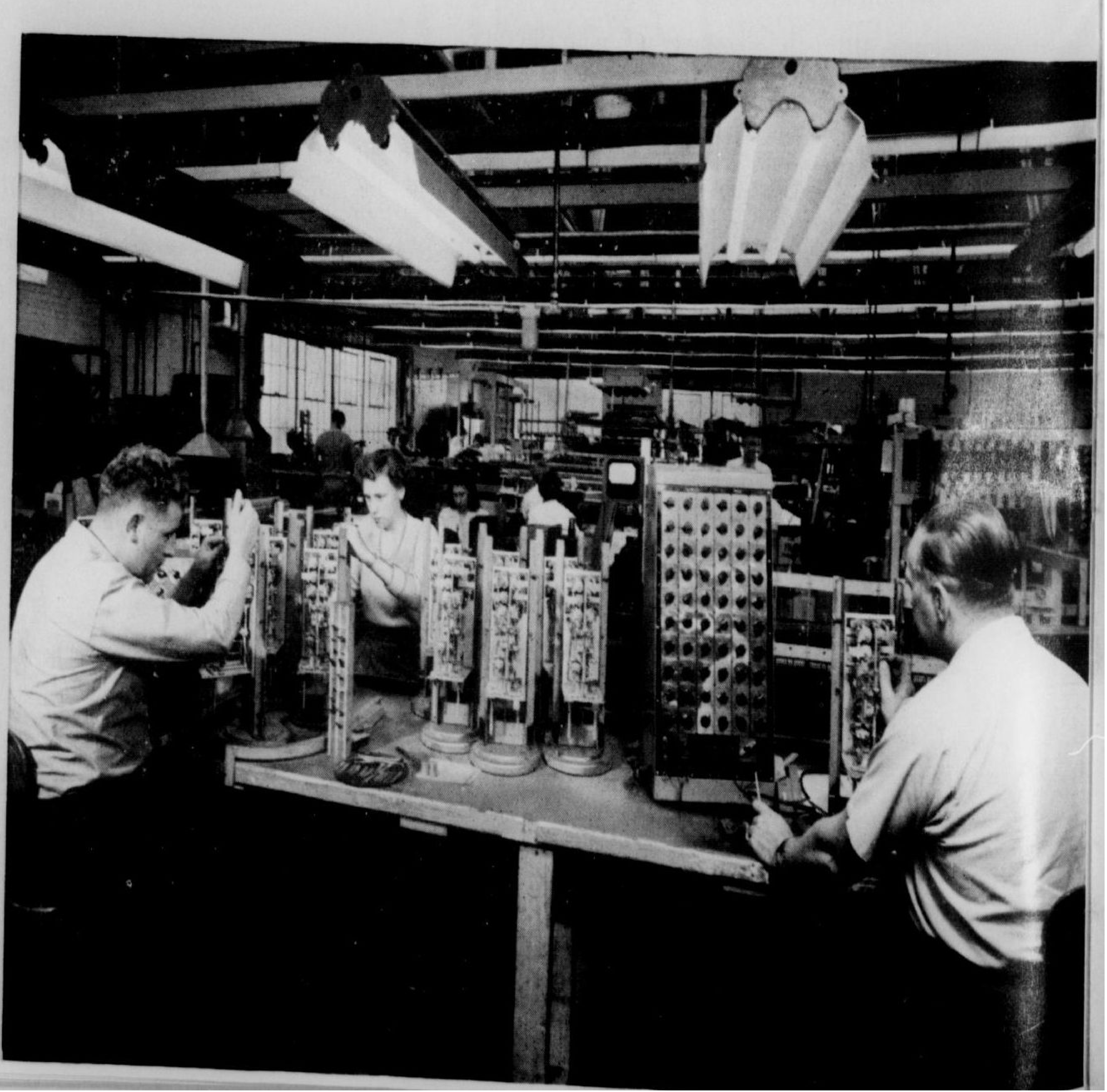
Multiple drill press for machining Strowger Switch frames.



Wiring Strowger switch bases.

Modern plastic molding processes produce telephones of surpassing beauty.

Modern Processes Insure Quality and Economy

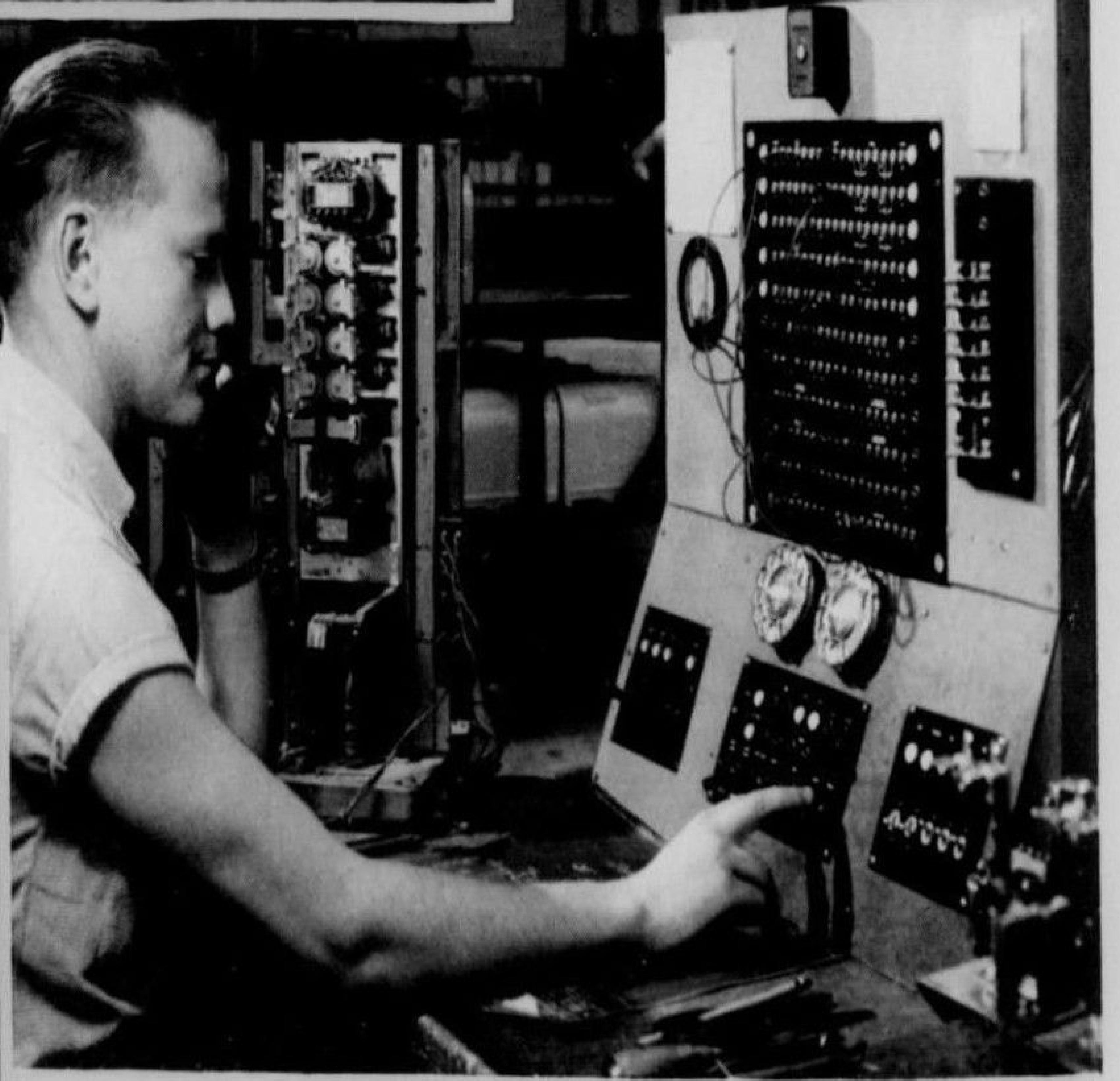


Switch assembly makes use of efficient production line procedures.

Quality Control in Every Process

By means of test units like this, coils are automatically tested for resistance and insulation breakdown. Lamp signals indicate acceptance or rejection.

Quality control of Automatic Electric production requires a comprehensive array of precision testing equipment, much of it being made and maintained by Automatic Electric's own quality control staff.



Testing circuits of Strowger switches and relay groups.

Completed automatic switchboards are subjected to final operating tests under extreme conditions by the use of portable test sets like this.

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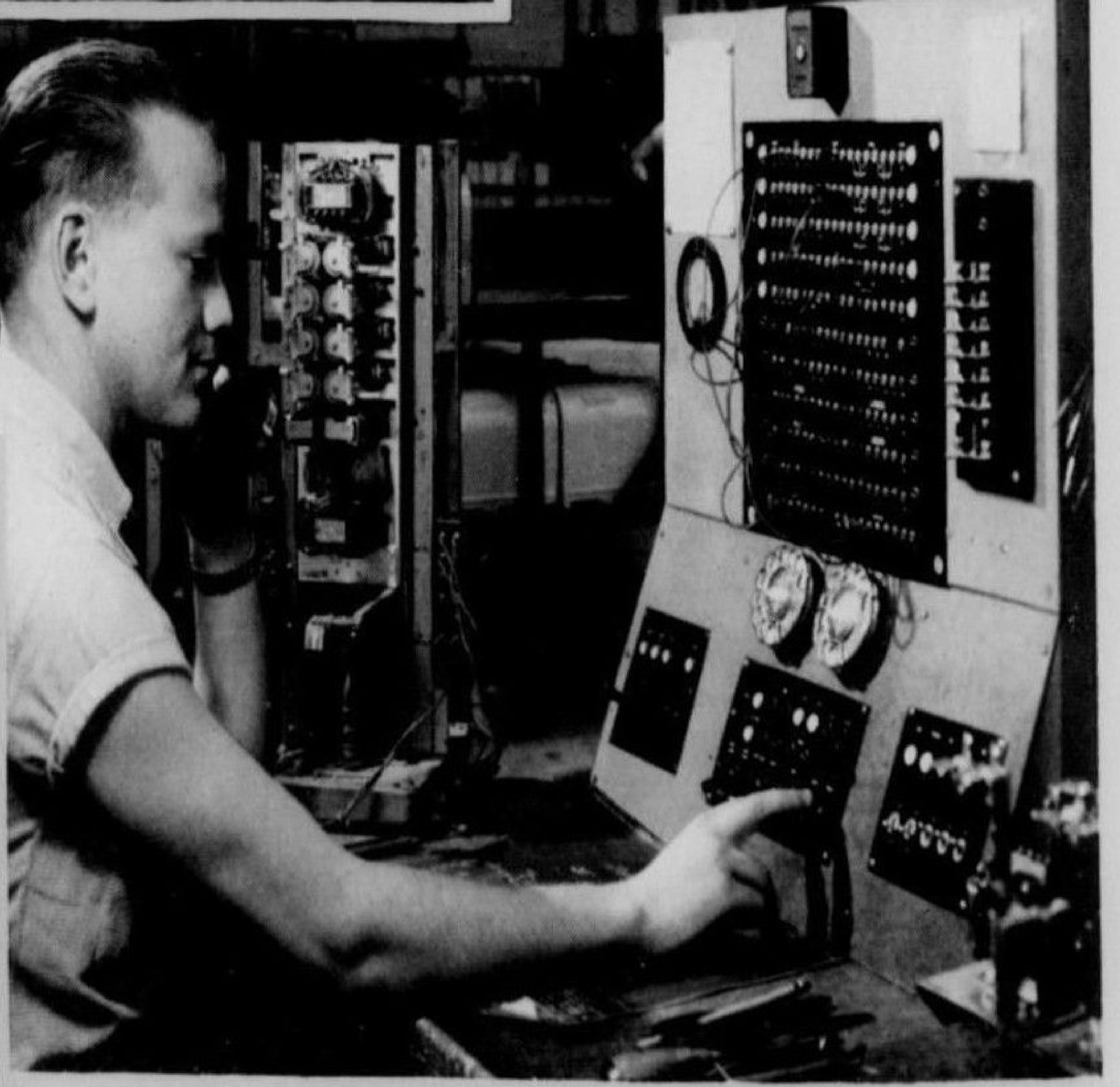


Testing circuits of Strowger switches and relay groups.

THE ADVANTAGES OF STROWGER AUTOMATIC EQUIPMENT

IN THE YEAR 1950, there were estimated to be more than 72 million telephones in service throughout the world, of which about 60% are automatic. Three-fourths of all these automatic telephones are connected to central offices which operate under Strowger principles originated by Automatic Electric, and developed largely by engineers of the Automatic Electric group.

This predominant use of Strowger Automatic equipment did not come about by chance, but rather because it is the only equipment which has consistently proved its ability to meet the needs of telephone administrations and their subscribers for the highest quality of service and the greatest economy to the operating organization.

Simplicity and *dependability* of apparatus are important factors in both quality and economy. The basic equipment unit, the Strowger Automatic switch, is a sturdy and compact electro-magnetic mechanism, fundamentally of the simplest construction, operating on the step-by-step principle under the control of relays. The trunking arrangements for the complete exchange are on a straightforward decimal basis, and the circuit principles are simple enough to be readily understood and the equipment easily maintained by anyone having a working knowledge of ordinary telephone apparatus. All Strowger Automatic components are designed and manufactured for *long service* and *unfailing reliability*. It is not uncommon to find Strowger Automatic exchanges that have been in continuous operation for thirty years or more and that are still giving dependable and satisfactory service.

The *flexibility* of Strowger Automatic equipment is an important factor in its economy. The equipment is constructed and assembled in small self-contained units which are arranged to "jack-in" to the permanent wiring of the mounting shelves. Thus the equipment can be initially grouped in large or small quantities to meet the requirements of individual exchanges or networks, and at the same time the quantity of these switches can be readily increased or decreased or any of the equipment shifted, as changes in traffic may require. This flexibility also results in economy in the use of floor space.

Furthermore, the flexibility of Strowger Automatic telephone equipment makes it ideal for enlarging existing exchanges, or adding to groups of exchanges, even where the original equipment is of another type of manufacture. This has been amply demonstrated by the successful addition of Strowger Automatic telephone equipment to such exchanges as those in Montevideo, in Milan and in Rome.

The *low maintenance cost* for Strowger Automatic equipment is a matter of record among the hundreds of telephone administrations which have used this equipment under varying conditions for many years. From the beginning of its development, Strowger Automatic equipment has been intentionally designed so that the few parts that may normally be expected to wear out with long continued use, such as wipers and wiper cords, can be quickly and easily replaced at very low cost for labor and materials, and without interruption to service. The company or administration that adopts Strowger Automatic equipment thus avoids all financial risks entailed by unpredictable maintenance costs.

THE AUTOMATIC ELECTRIC TRAINING SCHOOL

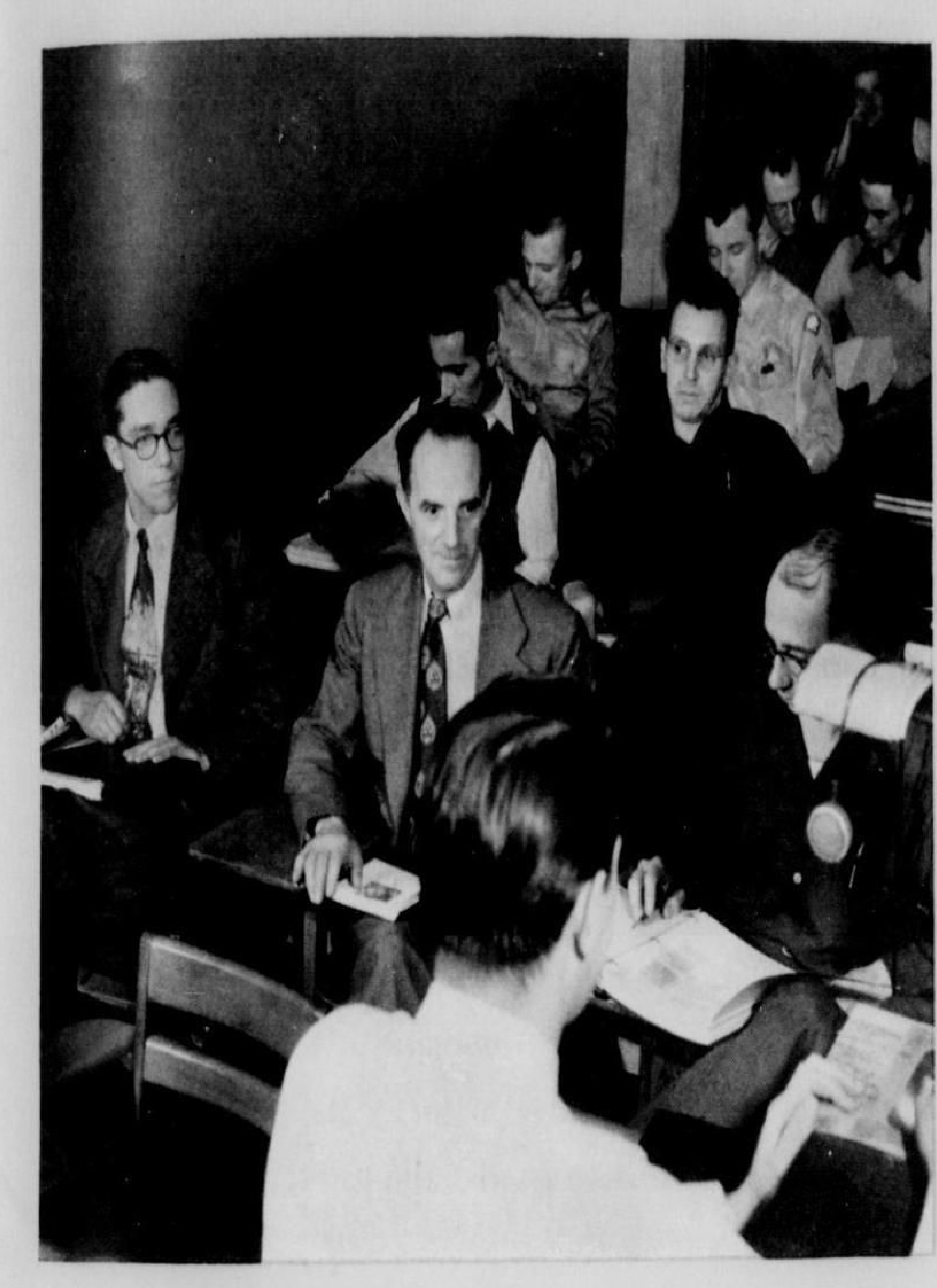
AN IMPORTANT factor in placing and keeping Automatic Electric in the forefront of telephone progress is its Training School, which insures a steady and adequate supply of trained personnel, both for its own staff and to meet the requirements of the companies and administrations which operate Strowger Automatic equipment. In this school young men with sound and broad scientific backgrounds receive specialized training fitting them for technical and supervisory duties which may lead ultimately to positions of top responsibility.

The students, selected graduates of outstanding engineering schools and men nominated by Automatic Electric's customers in all parts of the world, are given a thorough course in the basic theory of automatic telephony and kindred subjects through lectures and demonstrations by specially qualified Automatic Electric engineers and technicians. This is supplemented by an equally thorough training in shop work in all the production processes, whereby knowledge of and proficiency in each step—assembly, adjustment, inspection and testing—are gained through actual experience.

Through the years, the Training School has steadily grown in scope and influence, its graduates including not only a large number of Automatic Electric employees, but also many engaged in technical and commercial work for telephone enterprises in countries throughout the world.

Where Careers in Automatic Telephony Begin

Here a student from Arabia gets pointers on switch adjustment.



Left: The Automatic Electric Training School sessions include lectures by qualified technical personnel.

Below: Circuit class, showing instructor using the Visual-Cast Projector, by which a circuit is projected on a screen in front of the class.

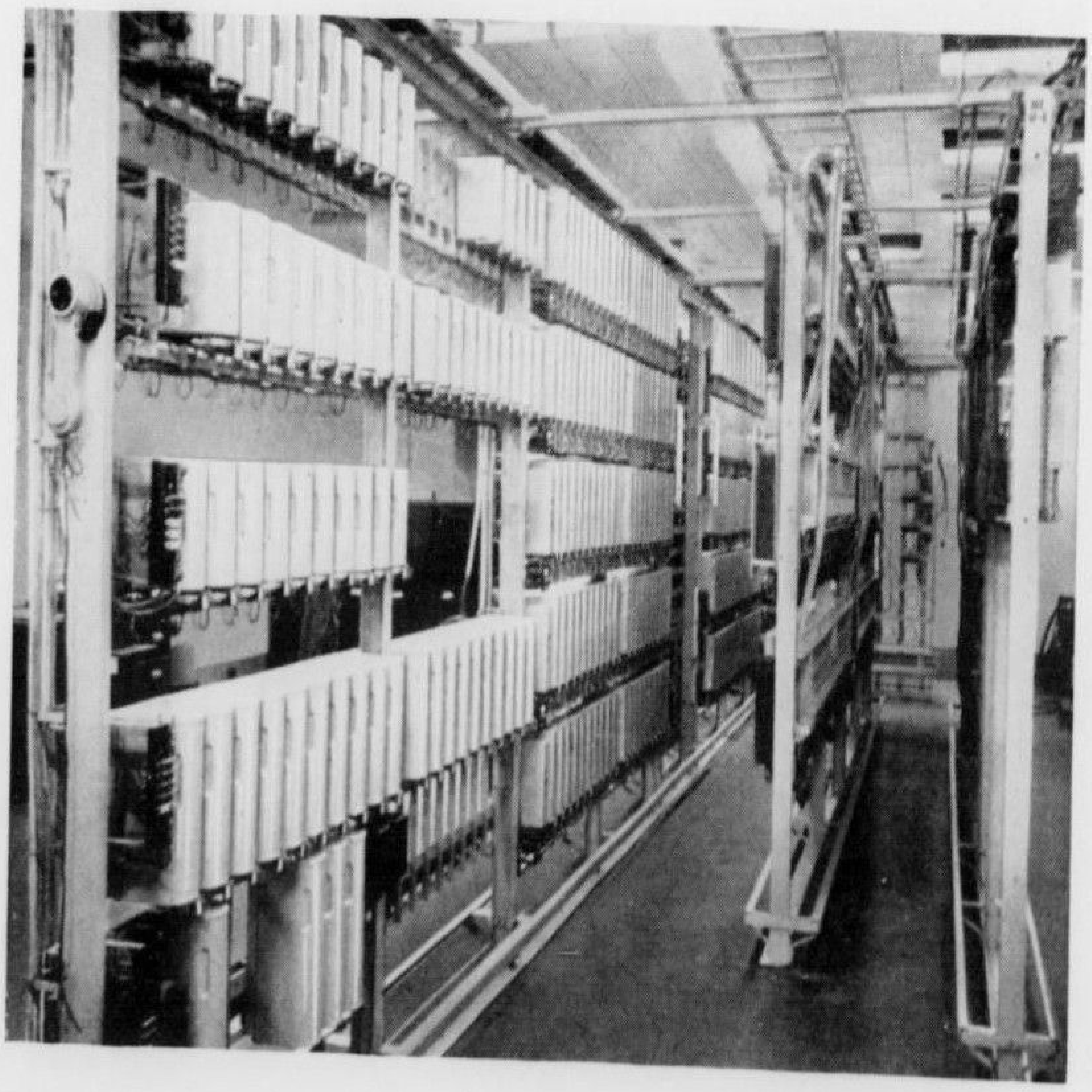
Above: This view shows students engaged in assembly and adjustment of Strowger switch mechanisms.

AUTOMATIC ELECTRIC AND THE ARMED SERVICES

THE DESIGN and manufacture of Automatic Electric communication equipment for military and naval uses dates back almost to the beginning of the Company's history. Prior to the first war, the U. S. Army and Navy had used Strowger Automatic equipment in various types of land stations, and during the second war, production of that equipment was continued on a vastly increased scale.

Use of Strowger Automatic equipment on Naval vessels began in the middle twenties, when the Company's engineers collaborated with the U. S. Navy Department in the design of the first ship's service automatic telephone system. By the end of the second war Automatic Electric had supplied such systems for over 350 vessels.

The Company was called on further to cooperate with both Army and Navy authorities in the development and manufacture of many special types of apparatus in the fields of communication and electrical control. Long experience in meeting the rigid and complex requirements of the armed services has not only placed Automatic Electric in a position to make enlarged contributions to this field, but also to fortfy its technical and manufacturing position with respect to the needs of its customers in the telephone field.



This is one of the large number of automatic telephone systems manufactured by Automatic Electric for the armed forces of the United States. (U.S. Army Signal Corps Photo.)

THE AUTOMATIC ELECTRIC
SERVICE ORGANIZATIONS

HIGHLY IMPORTANT to the operations of the Automatic Electric group are the sales and service organizations which, with their affiliated companies and branch offices, serve as points of contact between the manufacturing units of the group and their customers in all parts of the world.

The products of Automatic Electric Company, as well as those of other companies manufacturing plant construction material and supplies, are distributed in the United States by Automatic Electric Sales Corporation. This company maintains branch offices in all principal cities, and service representatives and staff engineers at strategic points who are readily available for consultation with telephone companies and industrial organizations who have need for their services. The Company also maintains branch warehouses at several points where supplies of telephones, construction materials, tools, and other products are kept available for prompt shipment.

International Automatic Electric Corporation, with its affiliated companies and branch offices and representatives throughout the world, acts in a similar capacity in the distribution of Automatic Electric products outside of the United States. A complete list of these companies and their branch offices and representatives will be found at the end of this booklet. The representatives of these companies are prepared by long experience and practical training in all phases of the business to consult with and assist telephone companies or administrations in solving whatever problems may face them.

FIELD ENGINEERING

The first step in the consideration of any Strowger Automatic installation is a detailed study of exchange traffic. Automatic Electric field engineers are prepared to supply competent assistance in making such studies, and can supply automatic recording equipment to insure accurate results with a minimum of labor. Such dependable traffic data permit Automatic Electric to specify switching equipment in the exact quantities and types required by the conditions.

PLANT ENGINEERING

In cases where re-arrangement or extension of outside plant is needed, Automatic Electric's experts in that field are in a position to offer counsel and recommendations. They are alert to the latest construction methods for city, town and rural lines, and can also advise as to the most efficient means of handling toll traffic and as to the latest techniques in carrier and radio-telephone systems.

INSTALLATION

In practically all cases, telephone central office equipment made by companies of the Automatic Electric group is installed, tested and placed in service by the manufacturing company's own personnel. This is desirable in order that the Company may turn over to the customer a completed installation, scientifically adjusted, thoroughly tested and ready for service. For this work the Automatic Electric group maintains staffs of installation technicians, who are not only thoroughly trained in the techniques of construction, wiring, cabling, and testing, but are also selected for their high qualities of self-reliance and judgment, and their ability to deal with customers and their engineers on a footing of dignity, competence, and assurance.

In addition, the Company maintains a staff of trained engineers who are thoroughly familiar with operating practices, and who are available for counsel or assistance to telephone administrations on matters relating to operating and maintenance procedures and, where the need arises, in the training of operating and maintenance personnel.

Automatic Electric installation technicians at work on a large automatic central office assignment.

A LOOK INTO THE FUTURE

In 1890 Strowger Automatic presented the great challenge to the telephone industry. Today, Strowger Automatic, and the vast accumulation of skill, experience and resources which is Automatic Electric, stand supreme in their field. In facing the future, those who have seen the inception and growth of that organization and have been a part of its development can take no narrow or partial view.

What lies ahead no one can foresee, but as yet no basic and revolutionary change comparable to that of the first two decades of this century, which rendered obsolete all that went before, can be discerned. Judging from the past, the portents of any such revolution, should it approach, will certainly be quickly perceived by those who make up Automatic Electric. As in the past, they will guide the stream of progress and keep abreast of it rather than follow it.

The more probable prospect is an orderly and logical refining and perfecting of that which now exists. To that end, the Automatic Electric group is giving constant and close attention to the need for meeting the increasing complexity of service requirements in both local and toll operations, and to the development and use of such supplementary services as may fit into the expanding pattern of telephone operations. Thus the work of Automatic Electric in this and related fields is following the traditional pattern of keeping research and development well ahead of field requirements.

In yet another way, Automatic Electric offers telephone operating organizations assurance as to the future:

Upon those responsible for the expenditures necessary to create and expand telephone operating systems the requirements of the future impose necessities which cannot be neglected. However well an installation may meet present needs, unless it can reasonably be expected to fulfill all conditions which may arise during the normal life of the equipment—unless it can be adjusted economically to unforeseen changes—it will present elements of uncertainty against which there can be no adequate protection. As never before this situation demands the most careful consideration in selecting the type of telephone equipment to be installed.

The history of Strowger Automatic, more than that of any other type of equipment, has been a history of success in meeting changing conditions. Small communities served by Strowger Automatic have grown into large towns; towns have become cities; single-office exchanges have become multi-office networks; traffic has increased, and service demands have become more complex. Strowger Automatic has never once failed to demonstrate its ability to meet all these changes at minimum cost and without disturbance to existing service or equipment.

For these reasons telephone operating companies and administrations face the future with the justifiable assurance that their investments in Strowger Automatic equipment can be amortized in an orderly and proper manner over a full life of service which will remain continuously modern, economical and adequate, and that as in the past, so also in the future, they can rely with confidence on the foresight, the progressiveness and the stability of Automatic Electric.

WHEN YOU NEED INFORMATION

IN A BOOKLET of this scope, it is impossible to present more than a broad perspective of the range of service and products offered by the Automatic Electric group. More specific information and literature on particular products will be supplied on request.

The Automatic Electric group maintains offices in principal cities throughout the world. Its resources and facilities are at your command, and its representatives are available for consultation on any project, small or large. Simply write or call the office nearest you.

TYPICAL USERS OF STROWGER AUTOMATIC TELEPHONE EQUIPMENT

LISTED BELOW are some of the hundreds of administrative organizations and companies operating telephone systems for public service in various parts of the world to whom companies of the Automatic Electric Group have supplied, or are supplying, Strowger Automatic Telephone Equipment:

ALASKA
City of Fairbanks

ARGENTINA
Argentina State Telephone Administration

AUSTRALIA
Australian Post Office

BELGIAN CONGO
Belgian Congo Administration

BELGIUM
Régie des Télégraphes et des Téléphones

BOLIVIA
Bolivian Power Company, Ltd.

BRAZIL
Companhia Telephonica Brasileira

CANADA
British Columbia Telephone Company
Chilliwack Telephones, Ltd.
Northwest Telephone Company
Okanagan Telephone Company
Saskatchewan Government Telephones
Alberta Government Telephones
City of Edmonton
Manitoba Telephone System
Port Hope Telephone Company
Town of Kenora Utilities
The Avalon Telephone Company, Ltd.
Northern Telephone Company
Maritime Telephone & Telegraph Company

CANAL ZONE
Canal Zone Authority
Panama Railroad

CHINA
Ministry of Communications

COLOMBIA
Empresas Municipales de Cali
Cia. Telefónica de Barranquilla
Cia. Telefónica de Cartagena
Empresa Nacional de Telecommunicaciones
Boyacá Departmental Telephone System
North Santander Departmental Telephone System

CUBA

Cuban Telephone Company

ERITREA

Government of Eritrea

GREECE

Greek Telephone Organization

HAITI

Ministry of Public Works

HAWAII

Mutual Telephone Company

INDIA

Ministry of Posts and Telegraphs

ISRAEL

Ministry of Communications

ITALY

Italian State Telephone Administration
Società Telefonica Interregionale Piemontese e Lombarda
Società Telefonica Delle Venezie
Società Telefoni Italia Medio Orientale
Società Telefonica Tirrena

JAMAICA

Jamaica Telephone Company, Ltd.

JAPAN

Ministry of Telecommunications

LATVIA

Ministry of Communications

MANCHURIA

Ministry of Communications

NEW ZEALAND

New Zealand Post Office

PHILIPPINE ISLANDS

Philippine Long Distance Telephone Co.
City of Baguio Telephone Administration

PORTUGAL

The Anglo-Portuguese Telephone Co., Ltd.

PORTO RICO

Porto Rico Communications Authority

DOMINICAN REPUBLIC

Cia. Dominicana de Teléfonos C. por A.

SAUDI-ARABIA

American Arabian Oil Company
Saudi-Arabian Railroad
Trans-Arabian Pipe Line Company

SUMATRA

Northeast Railway Co. (Deli Spoorweg)

UNITED STATES

Independent operating telephone companies
Operating companies of the Bell System
United States Government—all departments

URUGUAY

Administracion General de las Usinas Electricas y los Teléfonos del Estado

VENEZUELA

Cia. Telefónica de Venezuela
Empresa de Teléfonos de Apure
Mene Grande Oil Company
Creole Petroleum Company

PRINCIPAL PRODUCTS Of The AUTOMATIC ELECTRIC GROUP

Strowger Automatic Telephone Systems—Complete automatic central office equipment for exchange areas of every size, from small towns to the largest metropolitan networks.

Community Automatic Exchanges—Unattended Strowger Automatic units for small rural or suburban areas, with facilities for switching into attended exchanges.

Toll Switchboards—Both automatic and cord types, equipped with the most modern circuits and facilities to meet the most exacting needs of local or nationwide long distance networks.

Toll Dialing Systems—Switching systems and circuit facilities for operator dialing over direct toll lines and tandem networks.

Strowger Automatic Toll Ticketing Systems—Complete facilities for subscriber toll dialing in metropolitan areas, including automatic timing and ticketing of short haul toll traffic, and "Director" facilities for universal numbering and alternate routing.

Manual Telephone Switchboards—Magneto and central battery switchboards for public exchange service and private branch exchanges to meet every commercial need.

Special Service Switchboards—Information, Wire Chief and Test, Repair, DS"A"', and all other types of auxiliary service desks, equipped as desired to meet local needs.

Telephone Instruments —Modern handset designs in molded plastic for automatic, central battery manual, or magneto manual exchanges; and a complete range of special types to meet particular needs.

Exchange Power Equipment—Control and supervisory panels, battery charging and ringing current machines, tone generators and interrupters, and all other power accessories for both small and large exchanges.

Telephone Exchange Accessories—Testing equipment and instruments; protective devices for central offices, substation and outside plant; paystations; battery eliminators and rectifiers; loading coils for physical and carrier circuits; traffic measuring devices; and all other accessories needed for the operation and maintenance of the modern exchange.

Electronic Equipment—Point-to-point and mobile radio-telephone systems; voice frequency repeaters with electronic amplification; single-channel and multi-channel carrier systems for telephone, telegraph, signal and pulse transmission over wire or radio circuits; voice operated constant level amplifiers.

Private Automatic Exchanges—A complete range of systems in all capacities, with or without central office connections, and with or without attendants' switchboards.

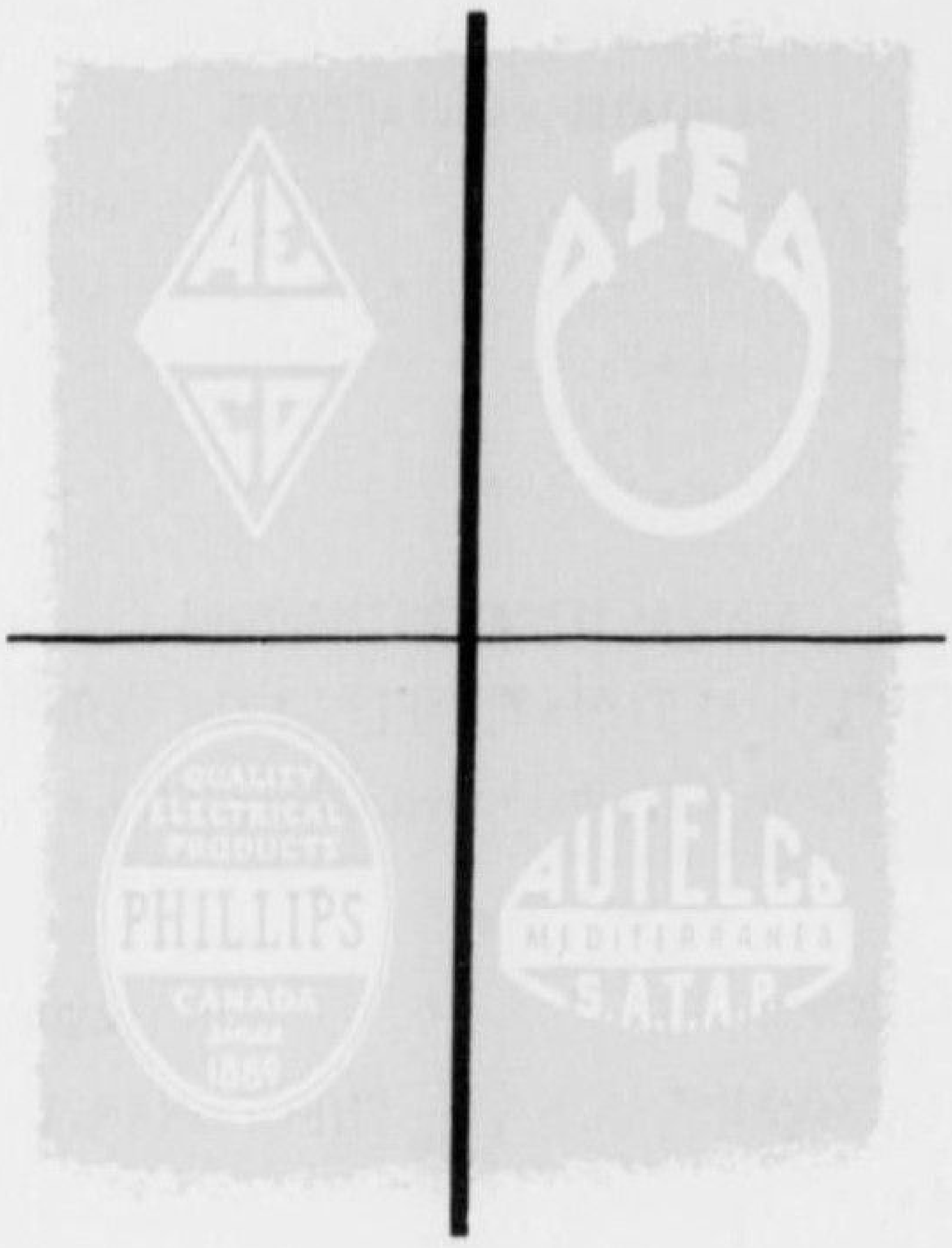
Intercom Systems — Modern push-button handset telephone systems, with single or multiple conversation channels in capacities to meet every business need.

Wires and Cables (Phillips)—Bare and insulated wires for communication, power and industrial applications; lead covered and braid-covered telephone cables; submarine cables; power distribution cables; copper rods; cold-drawn copper bus bars and sections.

Measuring Apparatus (ATEA)—A complete line of fixed and portable instruments for laboratory and industrial uses, including ammeters, voltmeters, frequency meters, phasemeters, and single and multiple pen recorders; watt-hour meters for single-phase or multi-phase use.

Traffic Signals (ATEA)—Modern street and road signal systems of both vehicle-actuated and fixed time types; synchronized and non-synchronized signals; interrupted warning lights; and level (grade) crossing signals.

Companies of the Automatic Electric group are makers also of electrical control apparatus and systems for industrial, engineering, and public utility companies and administrations, telephone apparatus for railroad and pipe line companies, electrical and communications devices for aircraft and airways control, and special communication apparatus for military and naval applications. Through their affiliated sales companies throughout the world, they also act as distributors of a complete line of materials, tools and supplies for the construction, operation and maintenance of all parts of the modern telephone exchange.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ATEA
QUALITY ELECTRICAL PRODUCTS
PHILLIPS
CANADA since 1889
AUTELCo
MEDITERRANEA
S.A.T.A.P.

AUTOMATIC ELECTRIC

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . . . Machine Switching Automatic Dial Systems

Makers of Telephone, Signaling and Communication Apparatus...Electrical Engineers, Designers and Consultants

Factory and General Offices: 1033 West Van Buren Street, Chicago 7, U.S.A.

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1033 West Van Buren Street, Chicago 7, U.S.A.
Sales Offices in All Principal Cities

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Autelco Mediterranea, S.A.T.A.P.	Milan, Italy

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Strowger Facts

Strowger Facts

"Facts are stubborn things" —SMOLLETT

AUTOMATIC ELECTRIC

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . Machine Switching Automatic Dial Systems

Makers of Telephone, Signaling and Communication Apparatus—Electrical Engineers, Designers and Consultants

1033 WEST VAN BUREN STREET CHICAGO 7, U. S. A.

Circular 1690 *March 1, 1946*

STROWGER FACTS

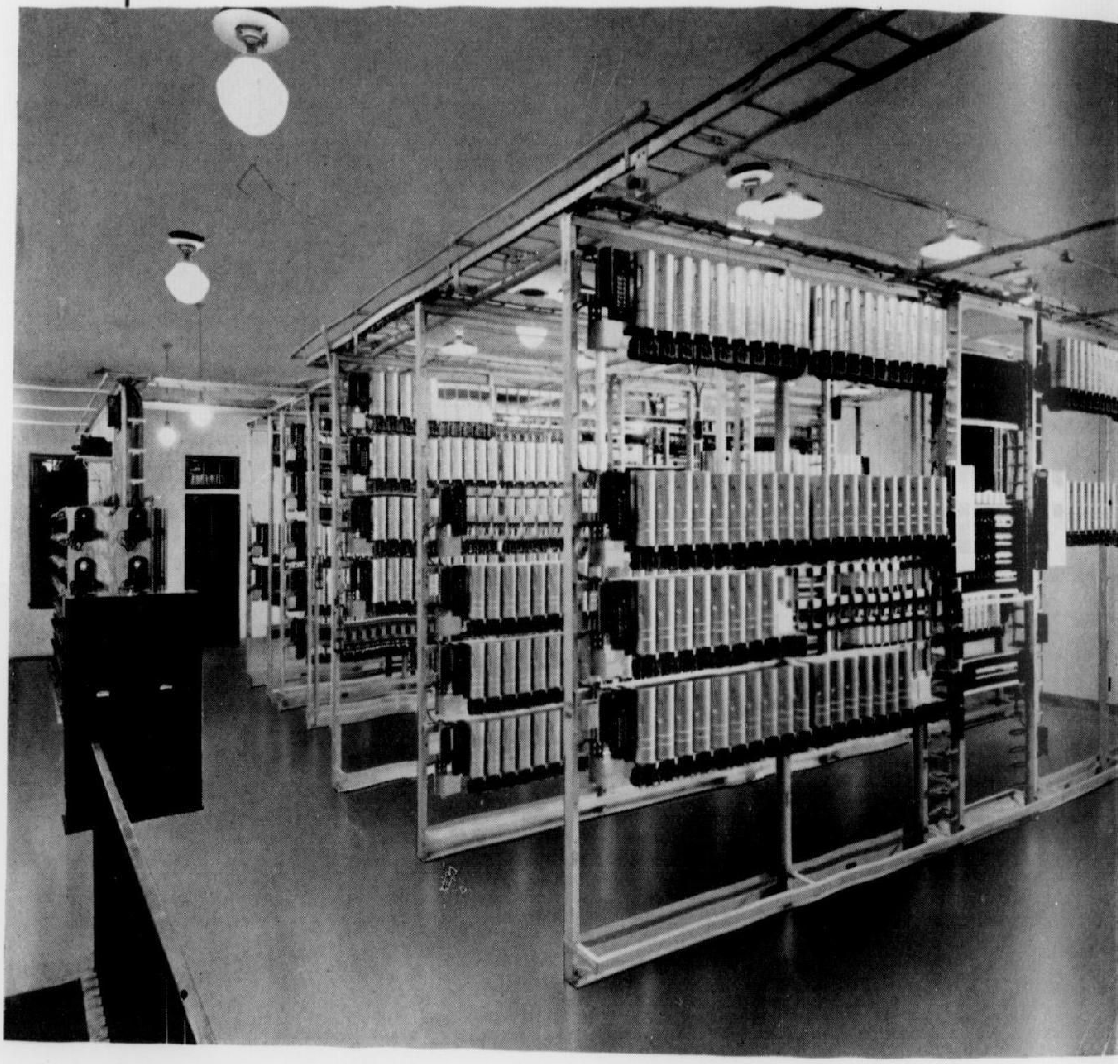
IN THEIR QUEST for better service for their subscribers and more efficient operation of their exchanges, many Independent telephone companies are facing, or will shortly face, a question of utmost importance to their future progress and prosperity. That question is:

"What type of automatic central office equipment shall we adopt?"

The importance of this question is clear. Once a choice has been made for any exchange, the operating company must live with it, for good or bad, over a long term of years. Hence a sound decision calls for the most careful study of such facts as are known, or can readily be ascertained, about the various types of equipment the company might wish to consider.

In making its studies, the operating company will do well to distinguish clearly between *facts* which are supported by adequate experience, and *claims* which relate to the unknown or unproved. The importance of this lies in the financial risks which are involved in decisions based on unproved assumptions.

This is a booklet of *facts* about Strowger Automatic Telephone Equipment. The statements it contains are drawn from the experience of hundreds of Independent telephone companies whose use of Strowger equipment extends over more than fifty years. We believe they will help other companies arrive at a sound answer to the question that so many of them now face.



● **AT LINCOLN, NEBRASKA**

College View Office of the large multi-office network operated by the Lincoln Telephone and Telegraph Company, users of Strowger Automatic equipment since 1905.

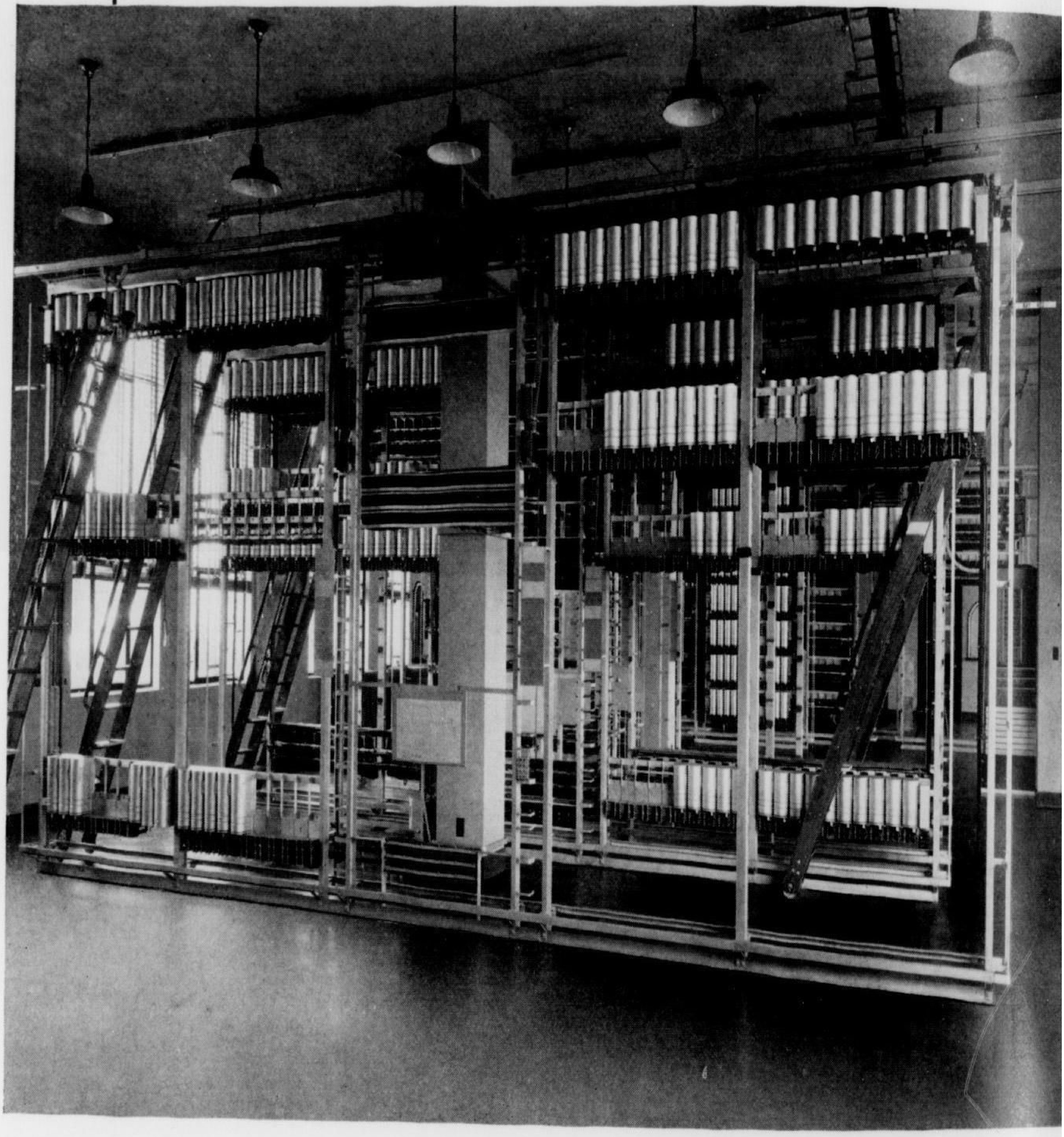
FACT ONE Strowger Automatic and the Independent Telephone Field

STROWGER equipment is the *only* type of automatic telephone equipment which has successfully met, year after year, all the conditions of operation peculiar to the telephone business in the United States, in both large and small exchanges, and in single-office and multi-office networks.

Beginning more than fifty years ago, Strowger equipment has served with outstanding success in hundreds of Independent telephone exchanges located in all parts of the country, and operating under the widest variety of conditions. It is the only type of automatic equipment available to Independent companies which has this extensive background of development and use.

Strowger installations for Independent companies are serving successfully in such diverse types of situations as the multi-office networks of Fort Wayne, Long Beach, Tampa, and Lincoln; unattended automatic exchanges in over 500 towns and villages in all parts of the country; and scores of single-office exchanges of "in-between" size.

The telephone company that adopts Strowger equipment has complete assurance that that equipment will meet the particular needs of any exchange which it operates. Experience has removed all uncertainty, and with it all financial risk involved in experimentation with equipment which is unproved in the Independent field.



● AT LONG BEACH, CALIFORNIA

Strowger Automatic in Termino Office of the Long Beach multi-office network, operated by the Associated Telephone Company, Limited.

FACT TWO *Stronger Automatic and Durability*

It is a well-established fact in the history of Strowger Automatic development that Strowger equipment has invariably lasted longer than any estimate made at the time of installation.

There are in service today among Independent companies many Strowger Automatic exchanges which were installed twenty five to thirty years ago and which are still meeting modern service standards at a cost for maintenance and operation which compares favorably with that of recent installations.

But Strowger Automatic equipment being made today is considerably better than the Strowger equipment which was built years ago. Better materials, more exactly fitted to the requirements, are now available, and these are being shaped and assembled by improved methods unknown a few years ago. It is therefore safe to predict that Strowger equipment now being produced will last even longer than that installed in the past.

Length of service is a real and important factor in the cost of any telephone equipment. The company that adopts Strowger *knows in advance* what that cost factor will be, and only Strowger has the background of use in the Independent field upon which such knowledge can be based.

AT BLOOMINGTON, ILLINOIS

Largest of the several Strowger Automatic exchanges operated in Illinois by the Illinois Telephone Company.

FACT THREE *Strowger Equipment and Maintenance Costs*

THE LOW maintenance cost for Strowger Automatic equipment is a matter of record among the scores of Independent companies which have used this equipment under varying conditions for many years.

From the beginning of its development, Strowger equipment has been deliberately designed so that the few parts that may normally be expected to wear out with long continued use, such as wipers and wiper cords, can be quickly and easily replaced at a very low cost for labor and materials and without interruption to service. Moreover, no new design or device is ever incorporated into Strowger equipment without being first subjected to exhaustive tests to determine its durability under actual conditions of operation.

The records of Independent telephone companies operating Strowger equipment provide all the facts that any company needs to be able to predict Strowger maintenance costs in advance. Only Strowger equipment has been in service in the Independent field for a long enough period of time, and under a wide enough variety of conditions, to provide such records. The company that adopts Strowger equipment thus avoids all financial risks entailed by unpredictable maintenance costs.

AT JAMESTOWN, NEW YORK

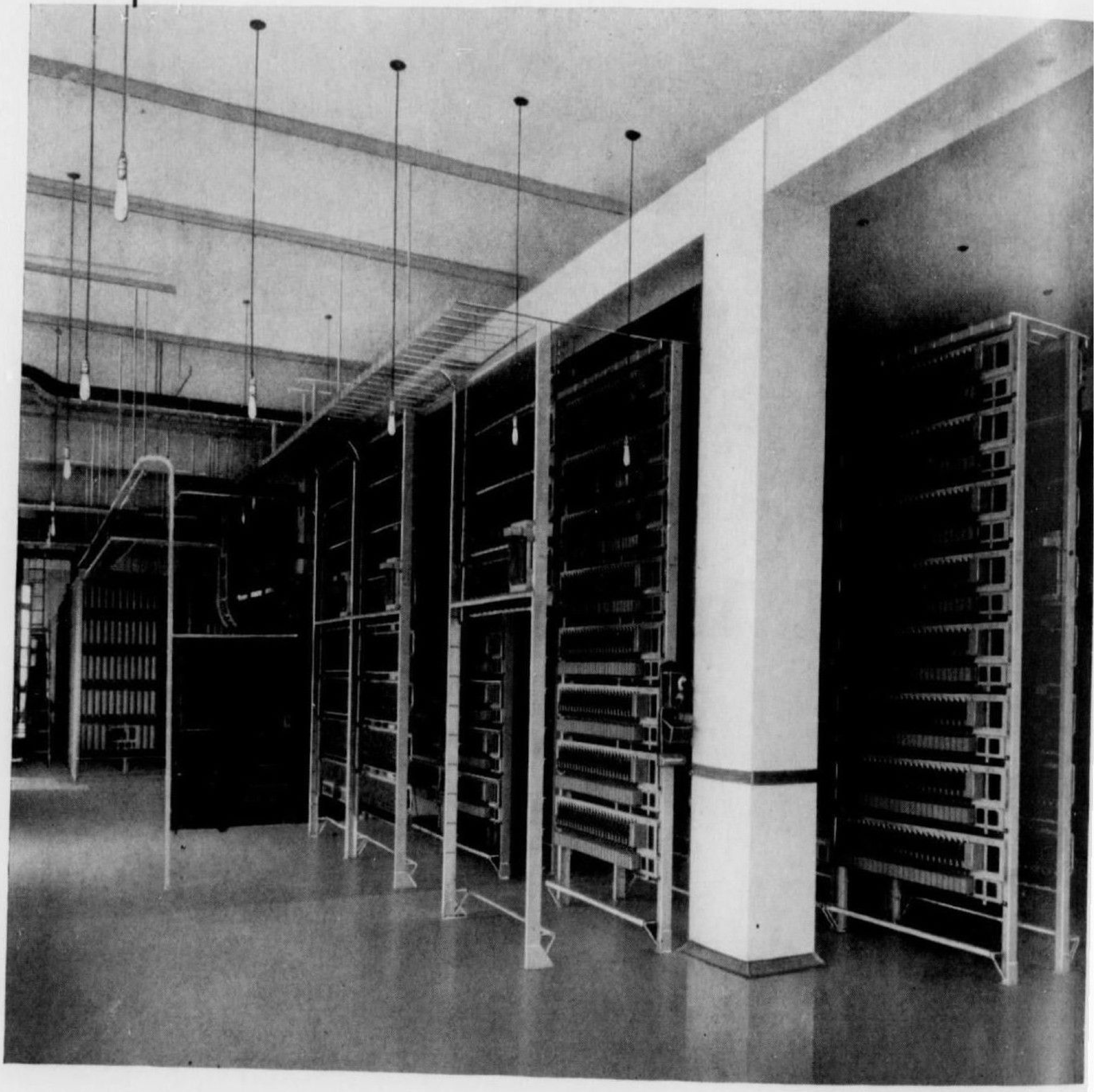
Besides this large Strowger Automatic installation, the Jamestown Telephone Corporation operates similar equipment in several suburban exchanges.

FACT FOUR *Strowger Automatic and Adaptability*

THE WIDESPREAD use of Strowger equipment throughout the Independent field embraces all varieties of service and operating conditions. It is significant that Strowger is the only automatic telephone system which has proved its ability to meet all of them with complete success.

Many service and operating requirements that exist in the Independent field are peculiar to that field. In no other operating area in the world are the requirements so varied and so complex. Beginning with the early years of this century, the development of the Strowger system has kept step with the growing needs of Independent companies. Over the years methods have been developed for handling all types of party line working, service to private branch exchanges (manual and automatic), paystation service, measured service, and for meeting the wide range of other needs in exchanges of every size, from small unattended rural exchanges to large multi-office networks.

The adaptability of Strowger equipment to every need of the Independent field is therefore not a matter of guesswork or assumption, but of proved fact. With no other automatic system has this adaptability been established by widespread and long continued use.



AT FORT WAYNE, INDIANA

Strowger Automatic equipment in the Fort Wayne multi-office exchange of the Home Telephone and Telegraph Company.

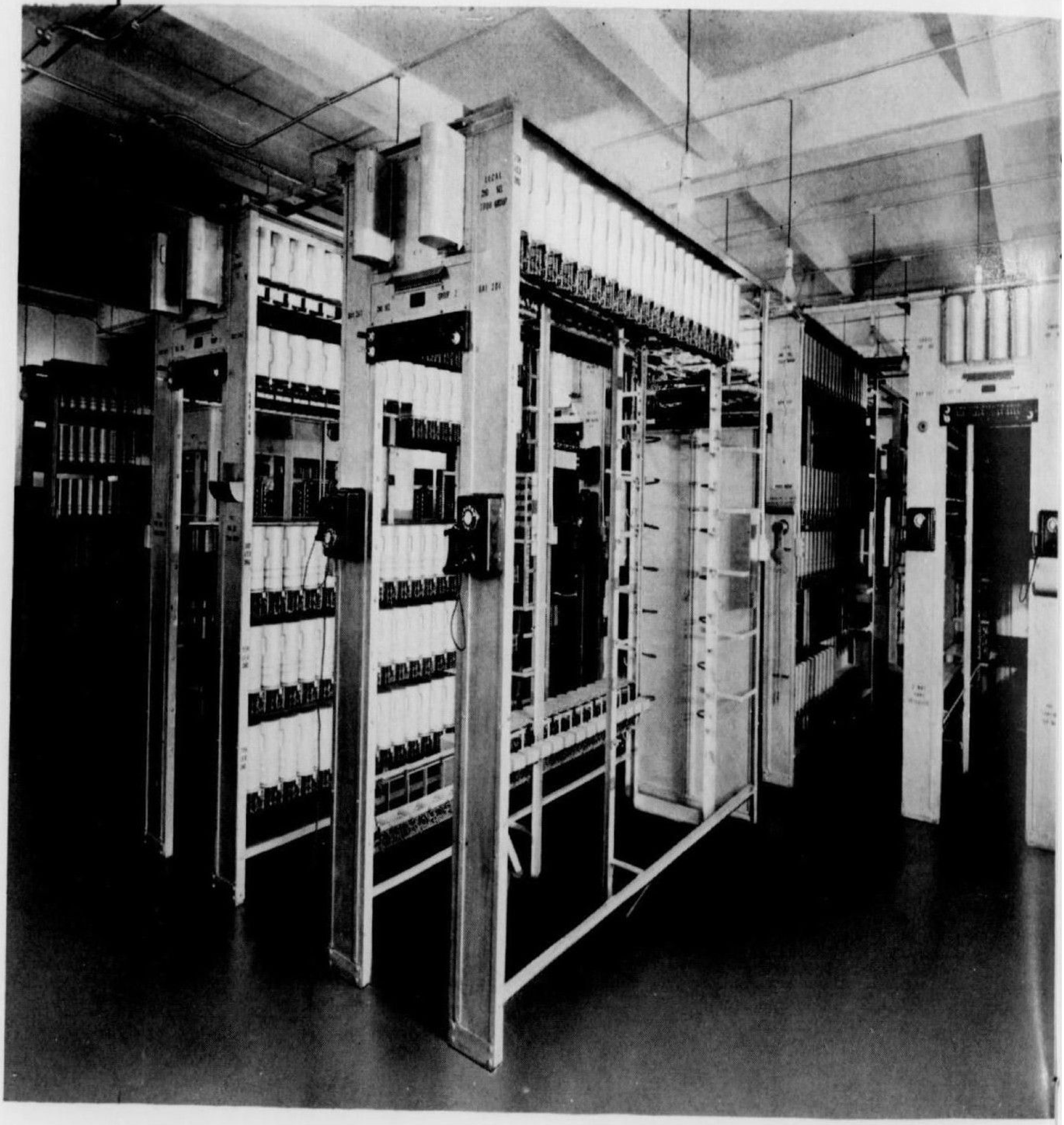
FACT FIVE *Strowger Automatic and Flexibility*

FOR MANY telephone companies, the postwar years will be years of unprecedented growth. Small communities will grow into large towns; towns will become cities; service demands and traffic will increase.

Strowger Automatic is the only automatic telephone system whose basic design permits easy growth by a simple step by step process of expansion. Standard frames, shelves, and switches are assembled to meet specific initial requirements with full provision for growth. To expand the exchange, you merely slip new switches into place. For further growth, you simply add new shelves or new frames, with equipment as needed. In all cases, the original equipment remains unchanged.

This same quality of flexibility is equally valuable in meeting changing traffic conditions. Strowger switches, small and interchangeable, can be quickly and easily shifted from one frame to another, or from one exchange to another, as changes in growth or traffic may require.

When your choice is Strowger, you *know* that your exchange will be able to grow as it needs to grow—or change as it needs to change—at minimum cost and without disturbance to existing service or equipment. Strowger is the only automatic equipment which has proved this capacity for easy growth and change.



AT MIDDLETOWN, NEW YORK

The Orange County Telephone Company uses Strowger Automatic not only in Middletown, but in many outlying exchanges as well.

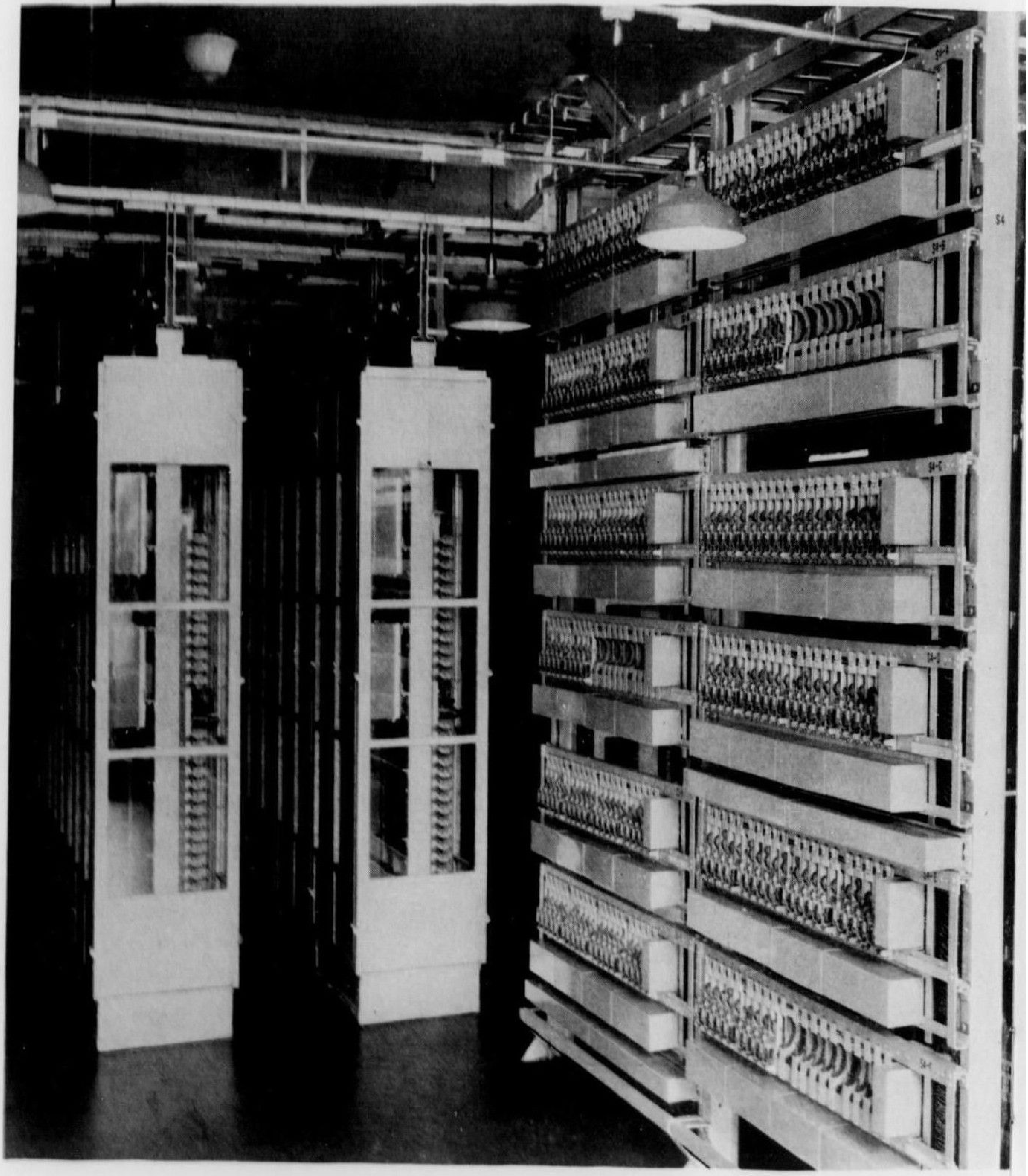
FACT SIX *Strowger Automatic and Toll Service*

THE FAST growing importance of toll service in all parts of the country makes it imperative that new automatic central office equipment be selected with the view to its adaptability to present and future toll network developments.

In this field of development, Strowger Automatic has a background of widespread use approached by no other type of automatic equipment. Beginning as early as 1910, Strowger principles have been applied to automatic dialing over toll lines. Today, in scores of networks throughout the country, Strowger equipment permits the operator at an originating exchange to dial direct to subscribers at distant points, either direct or through automatic tandem exchanges. It may also be arranged on a "Director" basis to provide digit translation to meet the requirements for universal code numbering of destination points.

Other Strowger toll switching developments which have proved their value through actual use include automatic toll boards for local and remote switching of toll circuits; automatic toll dialing by a-c and voice frequency currents; and automatic toll ticketing for subscriber toll dialing.

The company that chooses Strowger knows that its toll switching needs will be met, completely and economically. No other automatic equipment offers the assurance which this long experience brings.



AT MANKATO, MINNESOTA

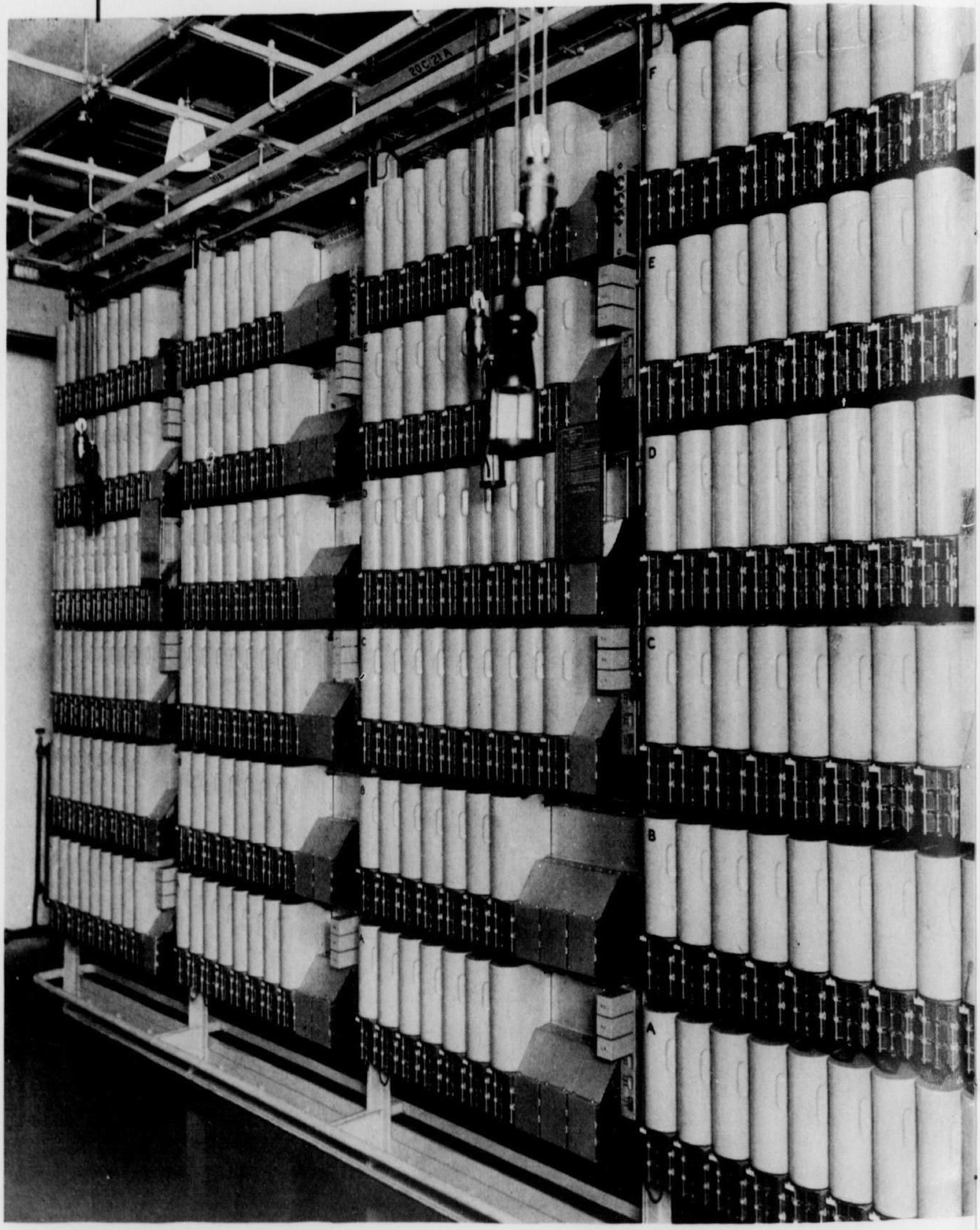
Strowger Automatic equipment in the headquarters exchange of the Mankato Citizens Telephone Company.

FACT SEVEN *Strowger Automatic and Production Techniques*

THE ENGINEERING and manufacture of automatic telephone equipment to meet the complex requirements of the Independent field cannot be accomplished merely by bringing together materials, tools and workmen. Only time can develop the proper techniques and the experienced staff necessary to guide and direct the various processes.

As originator and parent manufacturer of Strowger equipment, Automatic Electric Company is the only maker of automatic telephone equipment for the Independent field which has had continuity of organization—development, engineering, production, and installation—for over fifty years. At all times throughout this long period, the preponderance of organization personnel has been that of people experienced in the design, engineering and production of automatic equipment for the service of Independent telephone companies.

The Independent telephone company that chooses Strowger therefore avoids the hazards that are inevitable with unproved production techniques or new and inexperienced engineering and production personnel. Only Automatic Electric has the background of proved techniques which assure satisfactory performance under actual conditions of service in the Independent field.



AT BRISTOL, ENGLAND

One of the early installations of Strowger equipment made under the Strowger standardization program of the British Post Office.

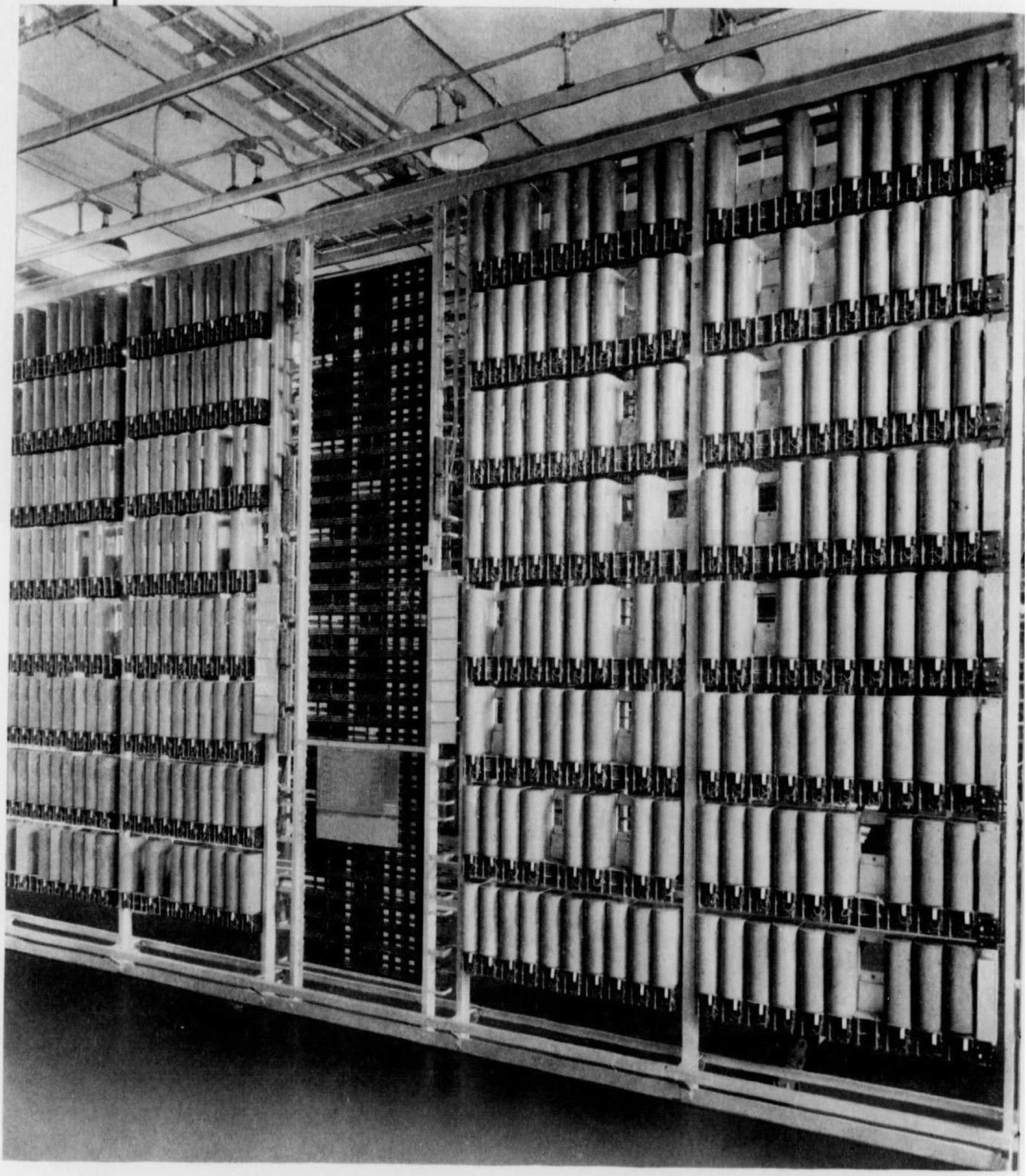
FACT EIGHT *Strowger Automatic and the World Picture*

AUTOMATIC telephone exchanges throughout the United States — both Independent and Bell — are predominantly Strowger.

But it is not only in the country of its origin that the Strowger system has achieved this predominance of use. Beginning shortly after the turn of the century, the leading telephone administrations throughout the world became interested in the Strowger System, studied it and adopted it. Today the telephone systems of most of the world's important cities are partially or wholly converted to Strowger working.

In Great Britain, the British Post Office, after the most exhaustive studies and tests, adopted Strowger equipment for use in all its public exchanges, including the London metropolitan network. The government operated telephone systems of Australia, South Africa, various countries in continental Europe, and most of the Canadian provinces, have also standardized on the Strowger System for both large and small exchanges. Strowger equipment is also used in such representative cities as Vancouver, Winnipeg, and Toronto, Canada; Honolulu, Hawaii; Buenos Aires, Argentine; Sao Paulo, Brazil; and the principal cities of Venezuela, Colombia, Uruguay and other Latin-American countries.

Independent telephone companies that use Strowger equipment thus have the assurance that comes from general acceptance among the world's foremost telephone companies and administrations.



● **AT ST. PAUL, MINNESOTA**

Strowger Automatic service began in this multi-office exchange in 1914, when it was operated by the Tri-State Telephone and Telegraph Company.

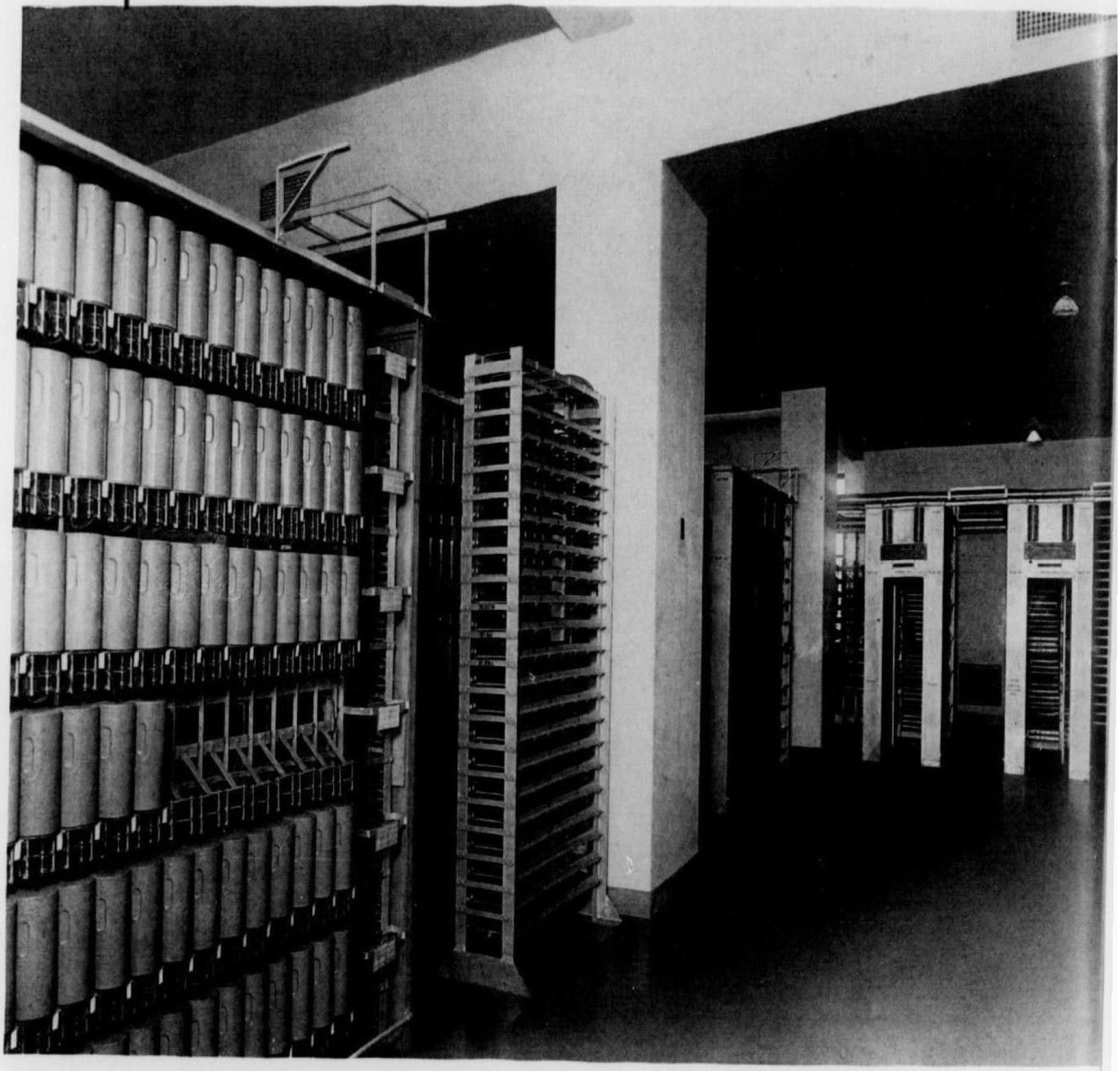
FACT NINE *Strowger Automatic and the User*

IN THE LAST analysis, it is the telephone user who places the stamp of approval or disapproval on telephone equipment. Close observance of this principle has been the guiding thought throughout the development and application of the Strowger Automatic system.

Wherever Strowger equipment has been installed, throughout the Independent field and elsewhere, it has set a standard of service by which other equipment is judged. "Service as good as Strowger" has been the goal of other types. "Service better than Strowger" has never been achieved.

Telephone users like Strowger dependability—its unfailing operation under all conditions. They like its speed and directness—its instant, accurate response to the user's wishes. And they like its uniformity—its ability to meet the highest standards of performance at any hour of the day or night, every day of the year.

Strowger equipment is the only automatic equipment which has been in service in the Independent field for a long enough period of time and under a wide enough variety of conditions to establish this record of continuously satisfactory service to users. The company that chooses Strowger therefore takes no chances with public approval. It avoids all risks which are inevitable in the use of unproved equipment.



● AT NORFOLK, VIRGINIA

The Norfolk Strowger Automatic exchange, installed in 1919, was the first conversion to be made in the comprehensive Bell program for the use of Strowger equipment.

What These STROWGER FACTS *Mean to You*

THE IMPORTANCE of the Strowger Facts outlined in the foregoing pages lies in their sharp distinction between costs and performance that are *known* and those that are *unknown.* The choice of Strowger equipment is supported by the knowledge that comes from long successful use in Independent exchanges of every size.

Since Strowger is the only automatic equipment which has had such widespread use among Independent companies, the choice of any other type involves uncertainty of performance and unpredictable costs for maintenance, operation and depreciation. The resulting risks, financial and otherwise, must be taken by the operating company, its stockholders and its subscribers. When the choice is Strowger, no such risks are involved.

For further facts about Strowger Automatic equipment and its application to specific exchanges or networks, we invite consultation with our service representative in the field or at our Home Office.

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Makers of Telephone, Signaling and Communication Apparatus . . . Electrical Engineers, Designers and Consultants

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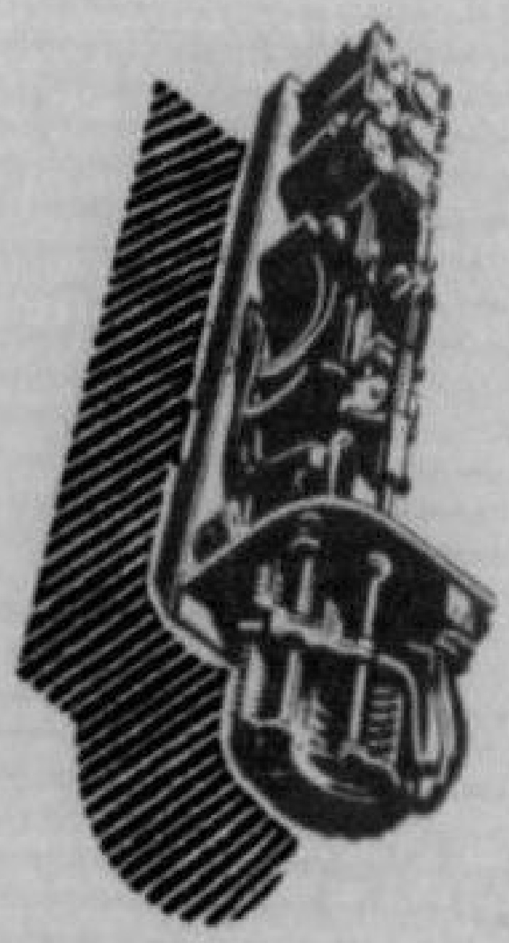
Strowger Automatic

TELEPHONE SYSTEMS



AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE AND SIGNALING APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS
1033 WEST VAN BUREN STREET CHICAGO, U. S. A.

Strowger Automatic

TELEPHONE SYSTEMS

●

AUTOMATIC ELECTRIC COMPANY
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1033 WEST VAN BUREN STREET CHICAGO, U. S. A.

Strowger Automatic

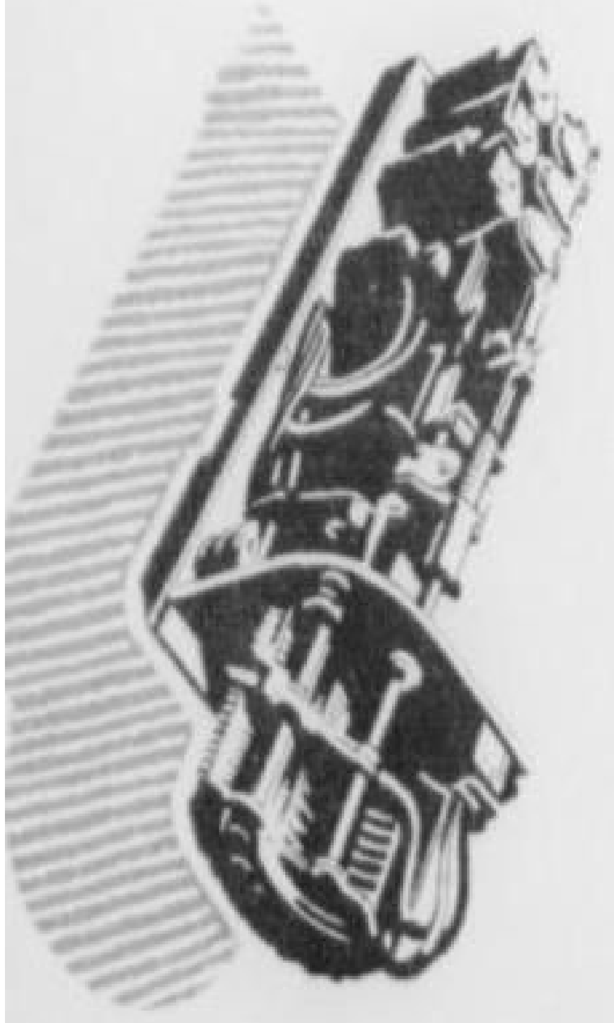
OF the more than forty million telephones in service in the world today, over one-half are "automatic" telephones — that is, they are connected to central offices in which the connections between lines are completed by switching mechanisms under the control of dials on the users' telephones. Today, about 75% of all automatic telephones in the world use the Strowger Automatic, or "step-by-step", system — the outgrowth of an invention which dates back to 1889.

Automatic Electric Company is the originator and parent manufacturing and development organization for the Strowger Automatic system. For fifty years, this company and its licensee companies in various parts of the world have been steadily developing and improving the Strowger system and adapting it to the rapidly growing needs of business and society.

EARLY STROWGER DEVELOPMENT

In 1892, the Strowger organization developed and installed the first automatic telephone installation ever to be placed in service — at La Porte, Indiana, U. S. A. This was followed by other Strowger Automatic exchanges varying in size from a few dozen lines to several thousand lines in scores of towns and cities throughout the United States.

As a result of this early experience, a basic design was evolved, which, while remaining unchanged in principle, has proved so sound and so flexible in application that it has met the most exacting tests of service and economy wherever it has been used.



As the demands for telephone service continued to grow and the operating requirements became more complex, the company's engineers systematically attacked the problems of adapting basic Strowger principles to new conditions and of providing the many service and operating features that are now accepted and standard in any modern automatic telephone exchange. They not only succeeded in meeting these requirements, but did so in such a way that service to the user was im-

MORE THAN FIFTY YEARS OF

proved as well. Thus, within a few years after the installation of the first automatic exchange — and long before other manufacturers began to show serious interest in the new method — they had arrived at a permanent solution of the basic problems of automatic telephony.

STROWGER WORLD EXPANSION

With this success as a background, it was inevitable that telephone operating administrations outside of the United States should become interested in the advantages of Strowger equipment. The system made its first appearance abroad in London in 1898 — an exhibit switchboard of 200-line capacity. A year later, the German Post Office purchased a 400-line system which they installed for public service in Berlin. These two installations were the earliest forerunners of the world penetration that was soon to come.

Canada, Cuba and Australia were among the first countries to recognize the manifold benefits of the Strowger system and to adopt it on a widespread scale. Argentine, India and New Zealand soon followed. For many years, all of the Strowger Automatic equipment installed in those countries was manufactured and installed by Automatic Electric Company.

Beginning in 1909, leading telephone manufacturers and telephone administrations throughout the world, foreseeing the inevitable trend towards automatic telephony, acquired licenses to manufacture the Strowger-type system under Automatic Electric Company patents. These licensees now include companies in the United States, Canada, England, Germany, and other countries. Automatic Electric Company and its subsidiaries and immediate affiliates also have factories for Strowger engineering and manufacture in the United States, Canada, Belgium and Italy.

Today, the leading telephone administrations throughout the world use Strowger Automatic equipment as standard, and the telephone systems of most of the world's important cities are partially or wholly converted to Strowger working.

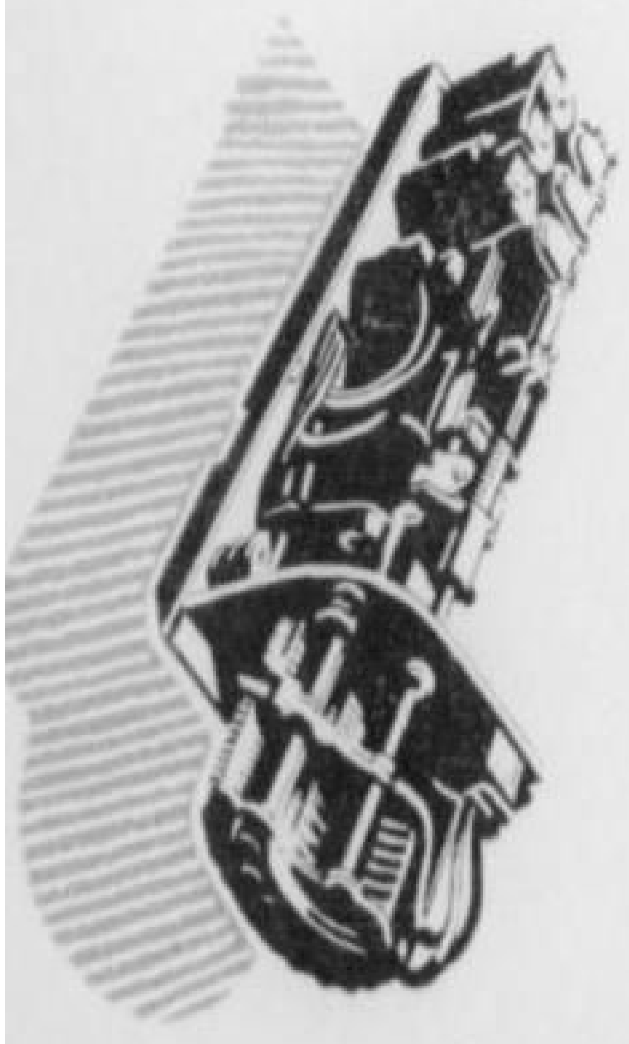
Notable examples of this widespread use are the many hundreds of large and small exchanges in the United States, including both Independent exchanges and those operated by the companies comprising the Bell System. Among these are the networks of such well-known cities as Philadelphia, Los Angeles, Minneapolis, St. Paul, and Dallas. A large and increasing portion of the automatic telephones operated by the Bell companies are on the Strowger system.

In Great Britain, the British Post Office, after the most exhaustive studies and tests, standardized on the Strowger system and is using it exclusively both in London and in scores of provincial cities. The government-operated telephone systems of Australia, South Africa and many of the Canadian provinces have also standardized on the Strowger system for both large and small exchanges.

Other cities using Strowger-type equipment include Vancouver, Toronto and Winnipeg in Canada; Buenos Aires, Rosario and Cordoba in Argentine; Sydney and Melbourne in Australia; Havana, Cuba; Honolulu and Manila in the Pacific; Berlin and other principal cities in Germany; Shanghai, Nanking, Foochow, and other cities in China; Tokyo, Yokohama, Osaka, and other cities in Japan; Sao Paulo and Petropolis in Brazil; and the principal cities in Venezuela, Colombia, Uruguay, and other Latin American countries. Strowger equipment is also in use throughout the Panama Canal Zone.

ADVANCES IN ENGINEERING TECHNIQUE

Since the earliest days of Strowger development, Automatic Electric Company has maintained one of the most efficient research and development laboratories in the world — with a staff skilled and experienced in the broad field of telephone communication, and particularly in the technique of automatic switching. During the years of world expansion in the use of the Strowger system, the Automatic Electric technical staff has steadily continued its work of perfecting the apparatus, increasing its efficiency, and extending its scope of usefulness. To attempt to list the many thousands of refinements they have added and are adding year after



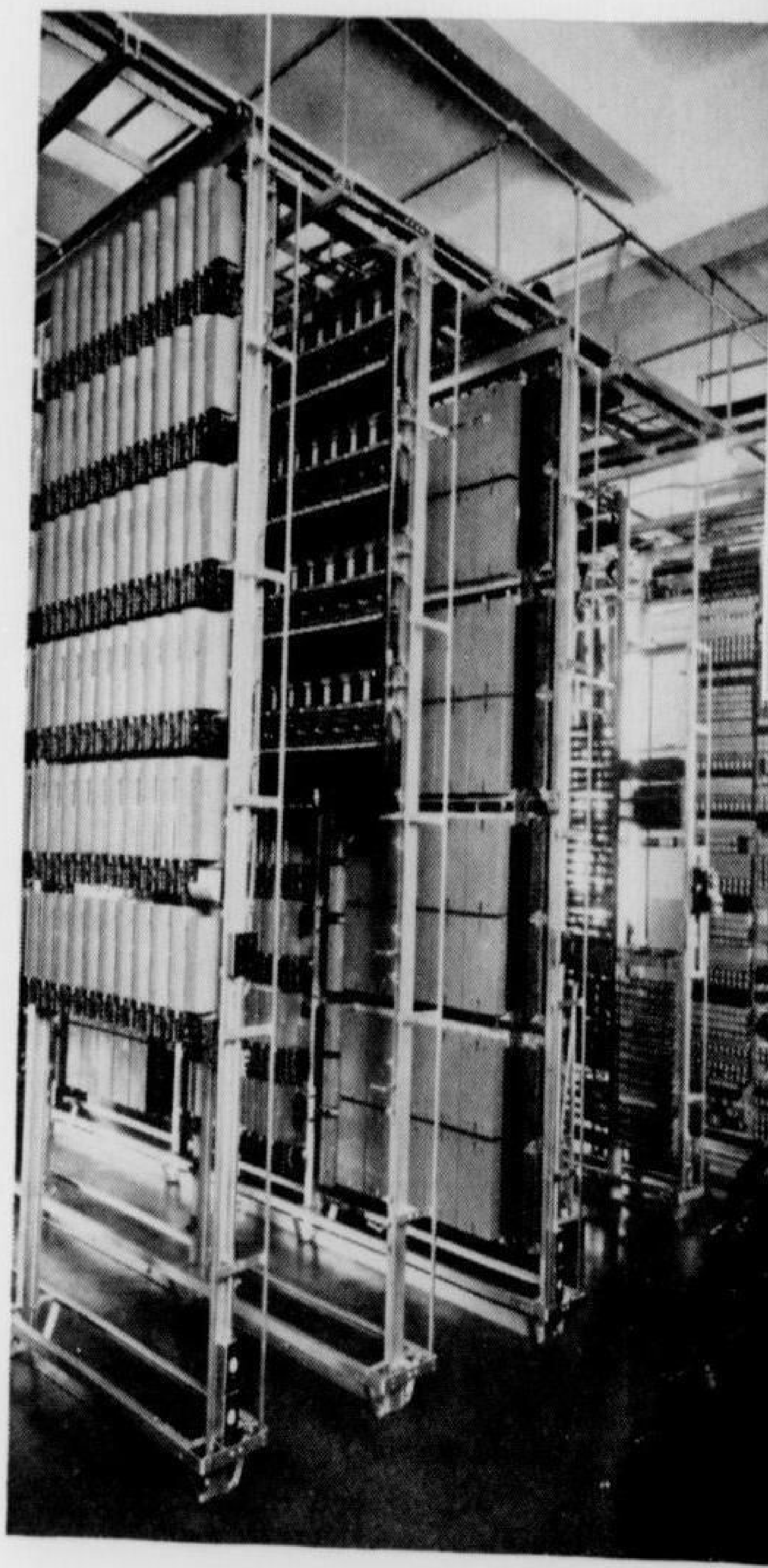
year would be fruitless, but it will be interesting to note a few of the outstanding principles which they have developed and which have become permanent features of the Strowger system wherever it is used. Among these are automatic trunk selection, automatic intermittent ringing, revertive ringing tone, toll line dialing, unattended rural exchanges, private automatic exchanges, and interconnections in multi-office areas. They have also pioneered in the adaptation of automatic principles and technique to the switching of toll traffic both in local areas and over long distance circuits extending through other exchanges.

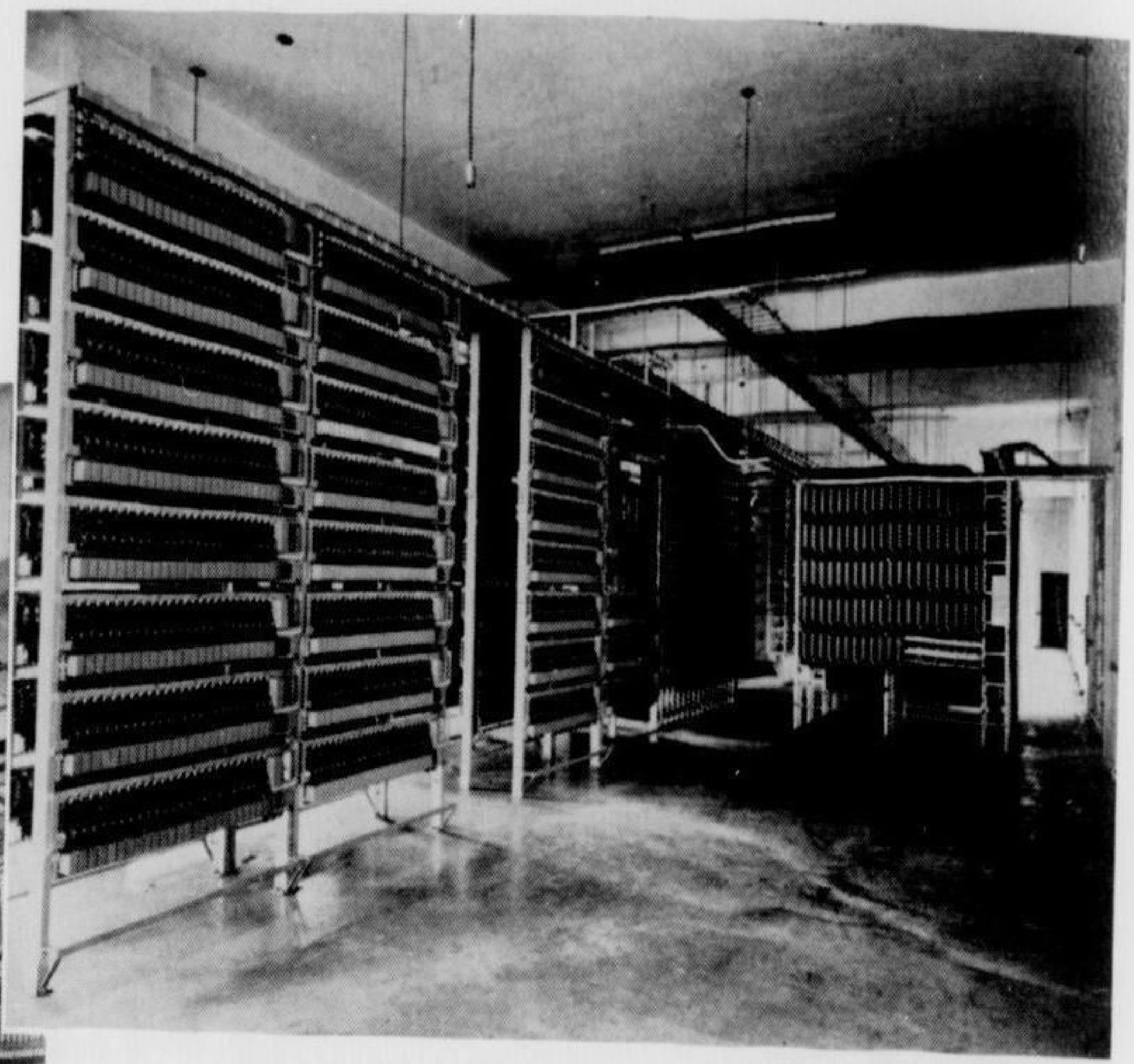
An especially significant step in the development of Strowger technique was the invention of the Strowger "Director" — a combination of standard Strowger components especially designed to meet the traffic and service conditions of large metropolitan multi-office areas on an economic basis. It was this development that was especially influential in the decision of the British Post Office to adopt Strowger equipment for use in the large and complex network of offices in the Greater London area. Conversion of this network on a Strowger Director basis is already well advanced.

The same experience and technique that have grown out of the work of Automatic Electric engineers in the field of telephone communication are also being successfully applied to the solution of electrical control problems in business and industry. Industrial plants, for example, use Strowger principles and apparatus in a wide variety of ways in the control and supervision of industrial production processes. Automatic Electric engineers are also meeting many requirements of the War and Navy departments of the United States Government for intricate electrical control devices for defense purposes. In the field of aviation, too, the increasing size and complexity of aircraft and the problems of airport and airways control have steadily increased the need for electrical control technique. Here again, the experience and skill of Automatic Electric engineers are finding increasing use.

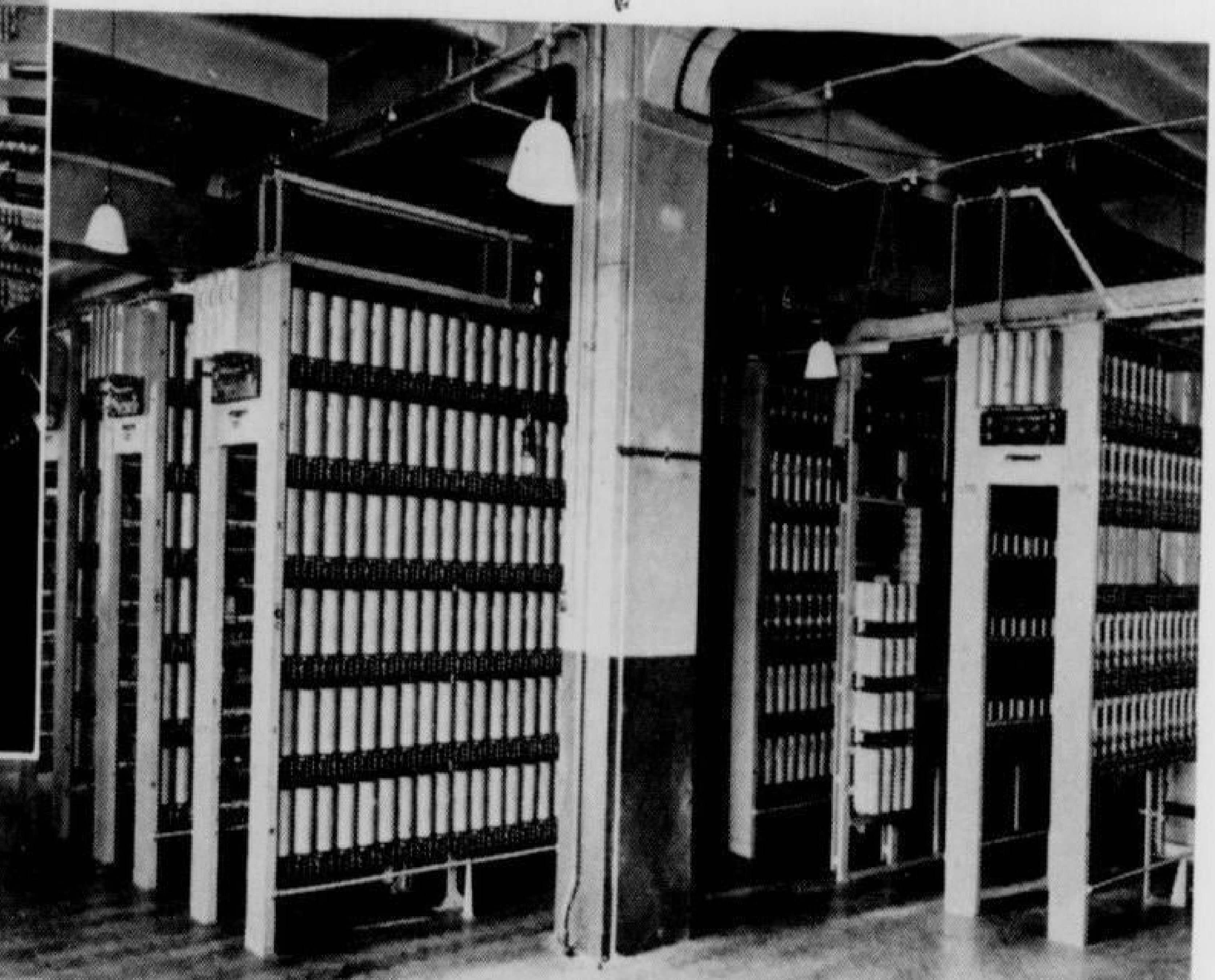
Strowger Automatic

Petropolis, Brazil



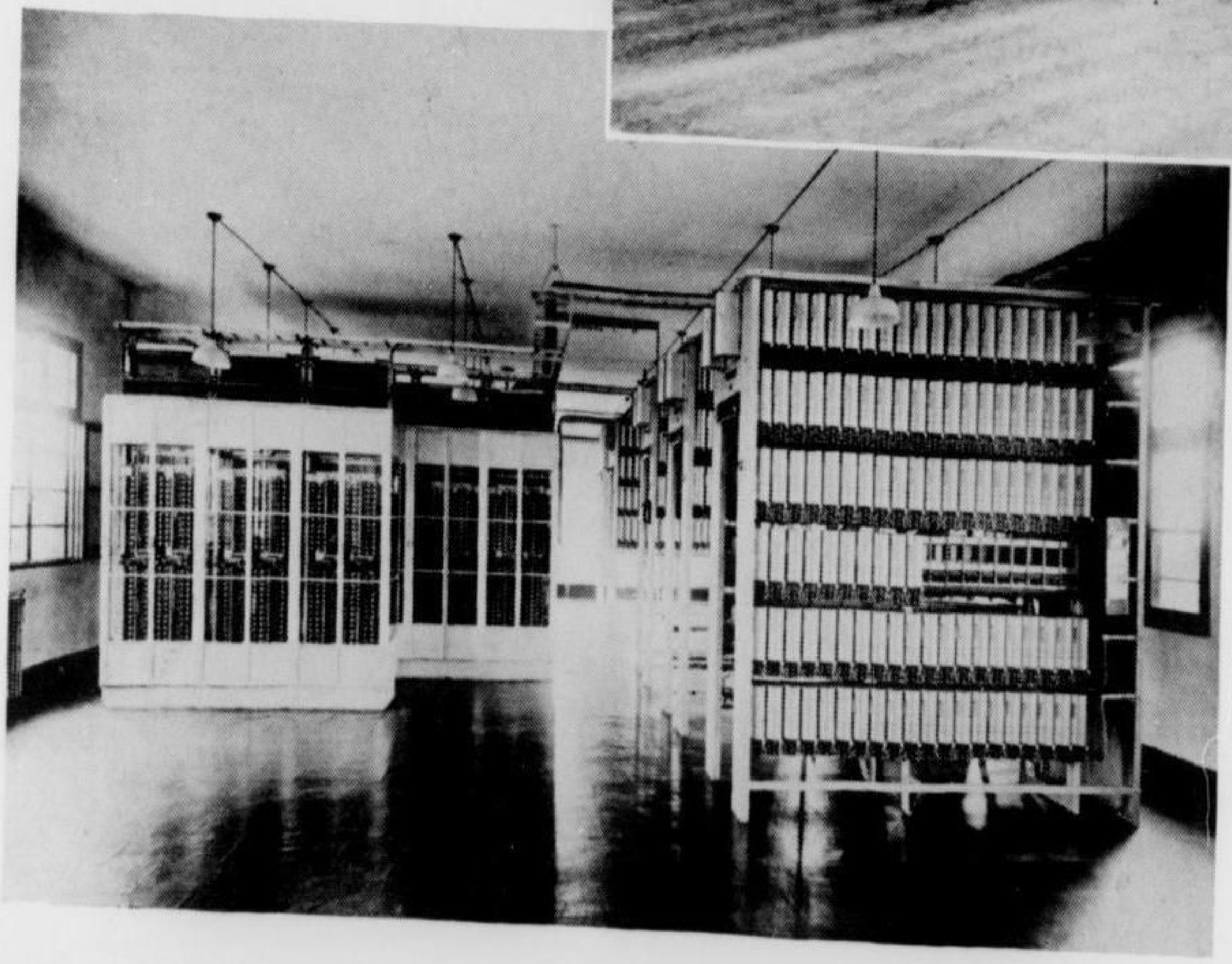


Fort Wayne, Ind., U. S. A.



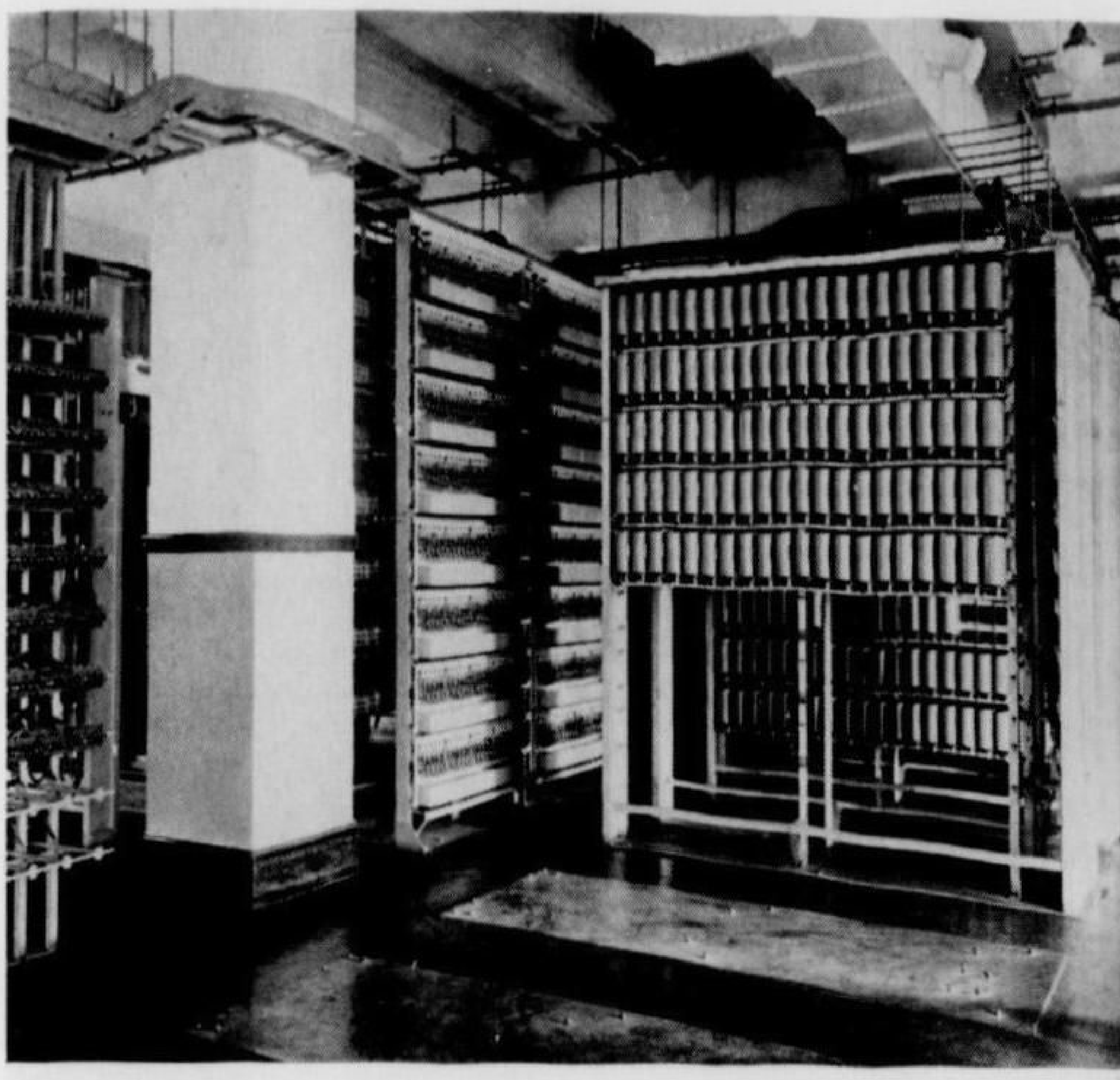
London, England

Nanking, China

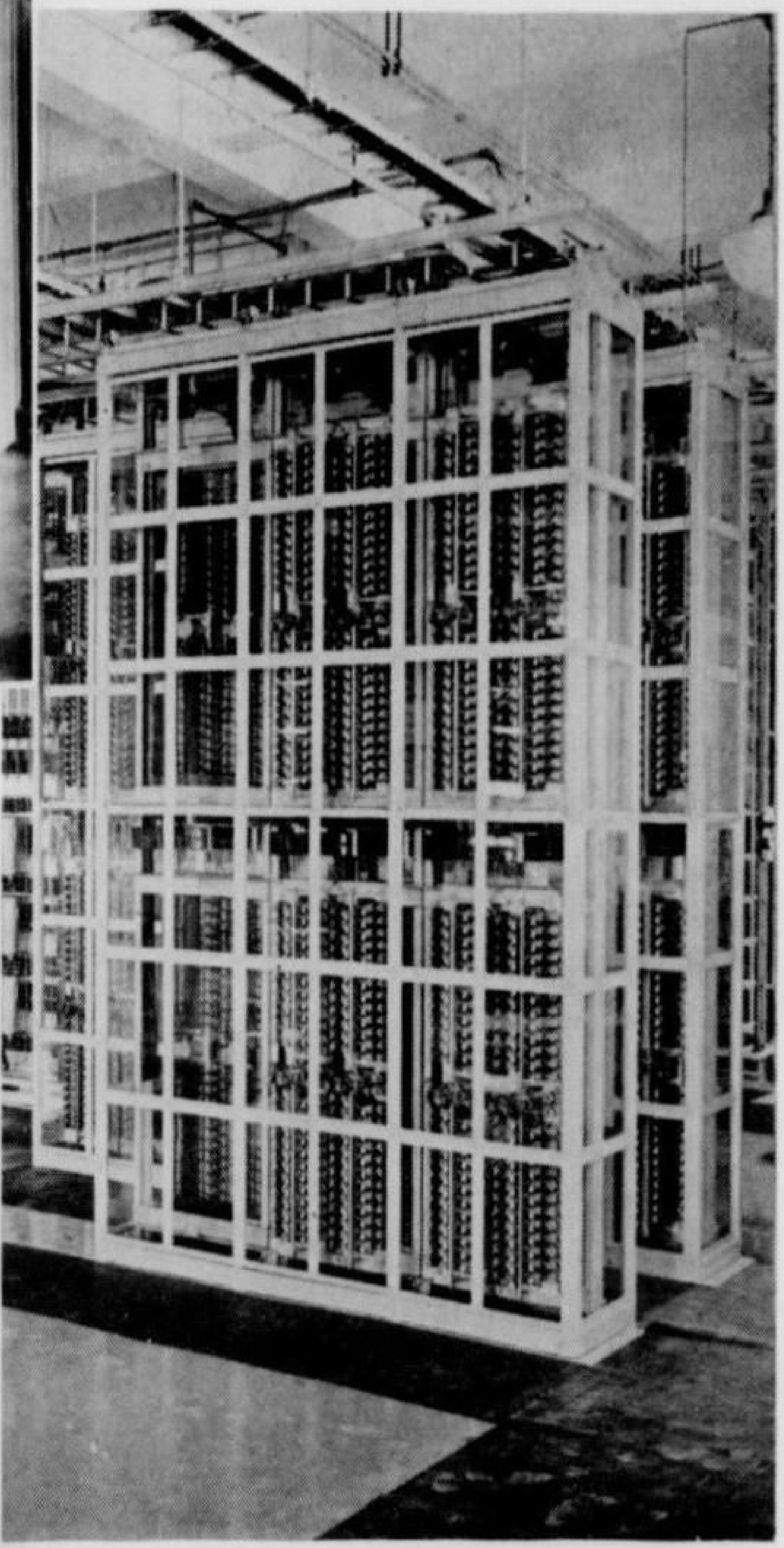


75% OF THE WORLD'S AUTOMATIC

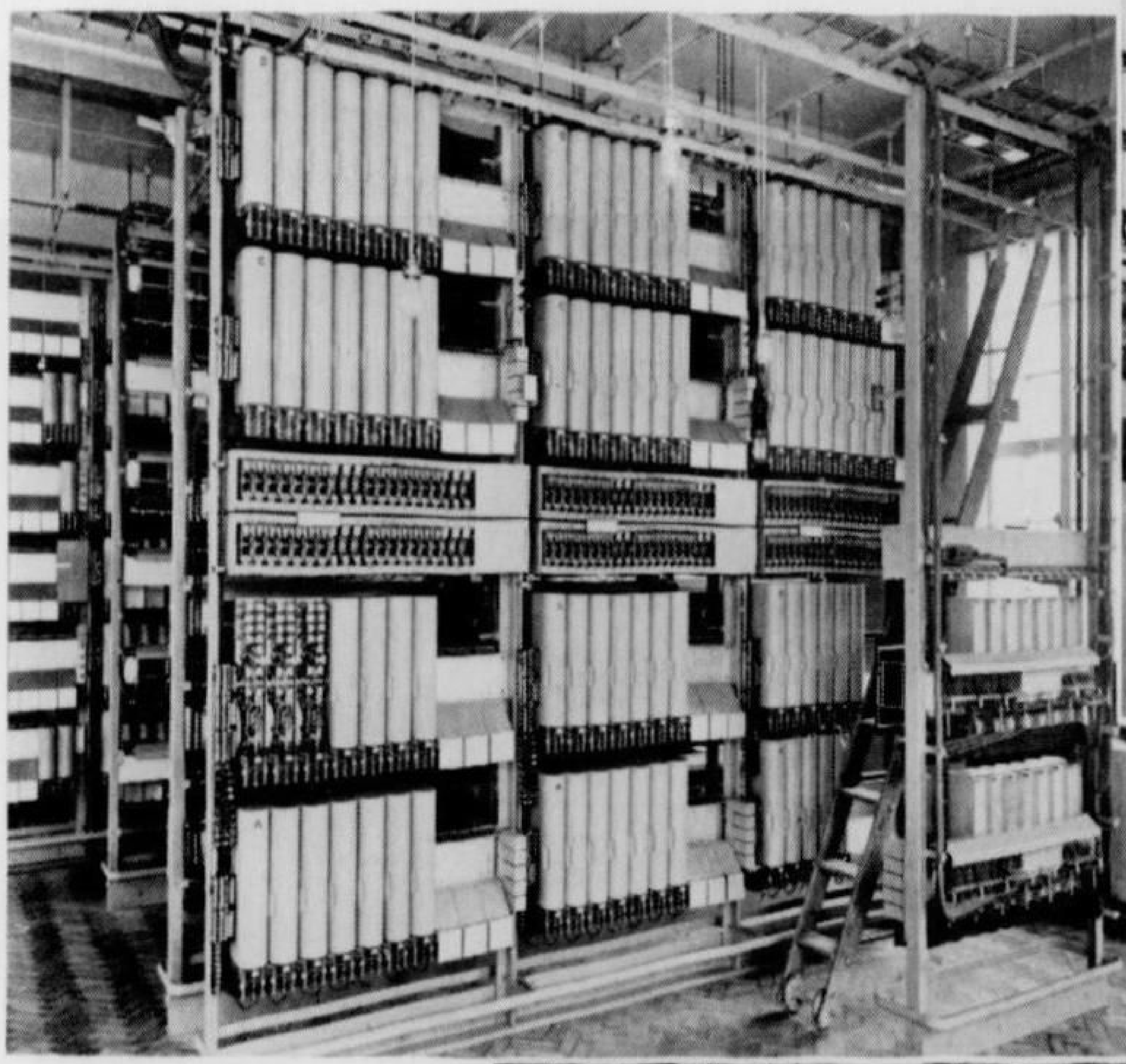
Telephone Systems



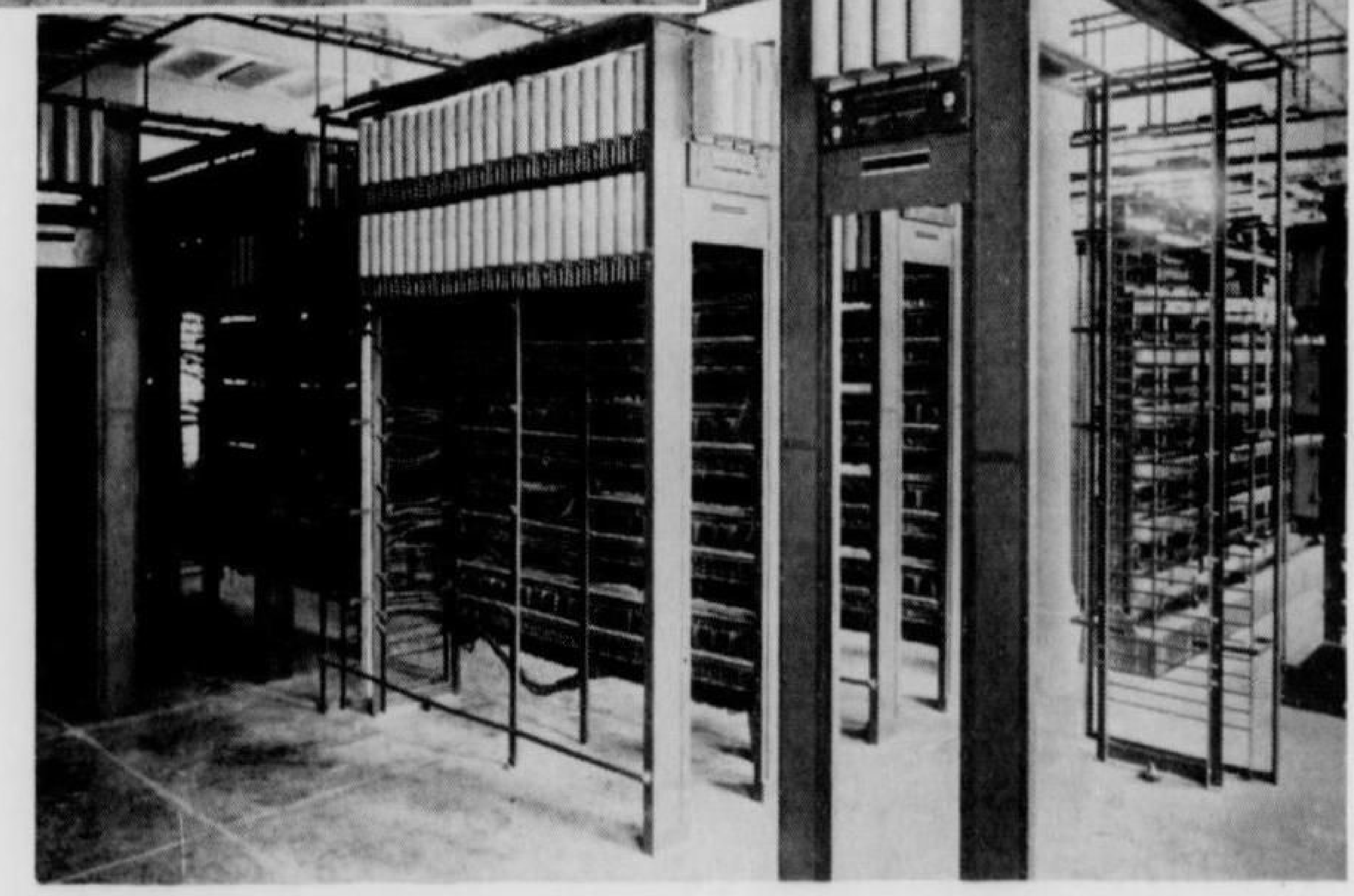
Tokyo, Japan



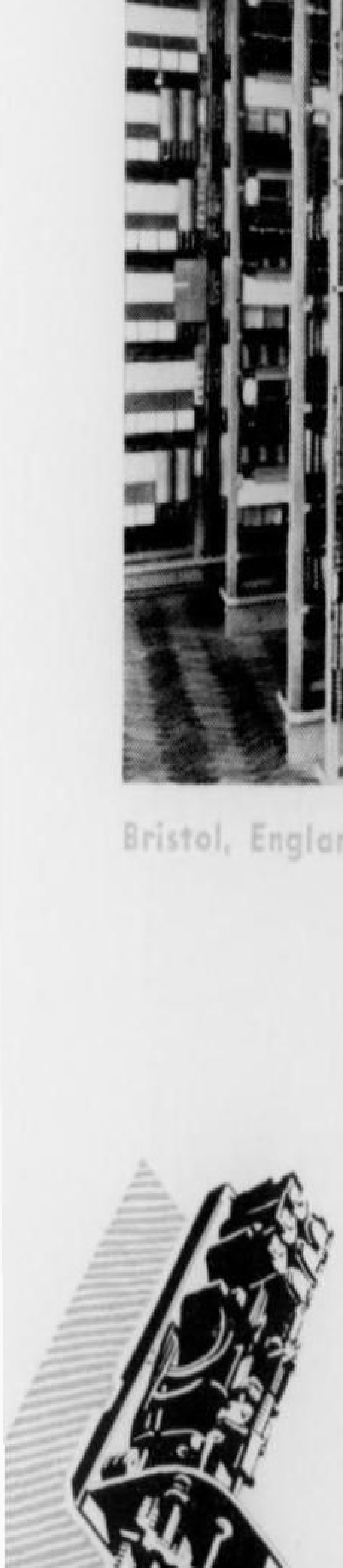
Barranquilla, Colombia



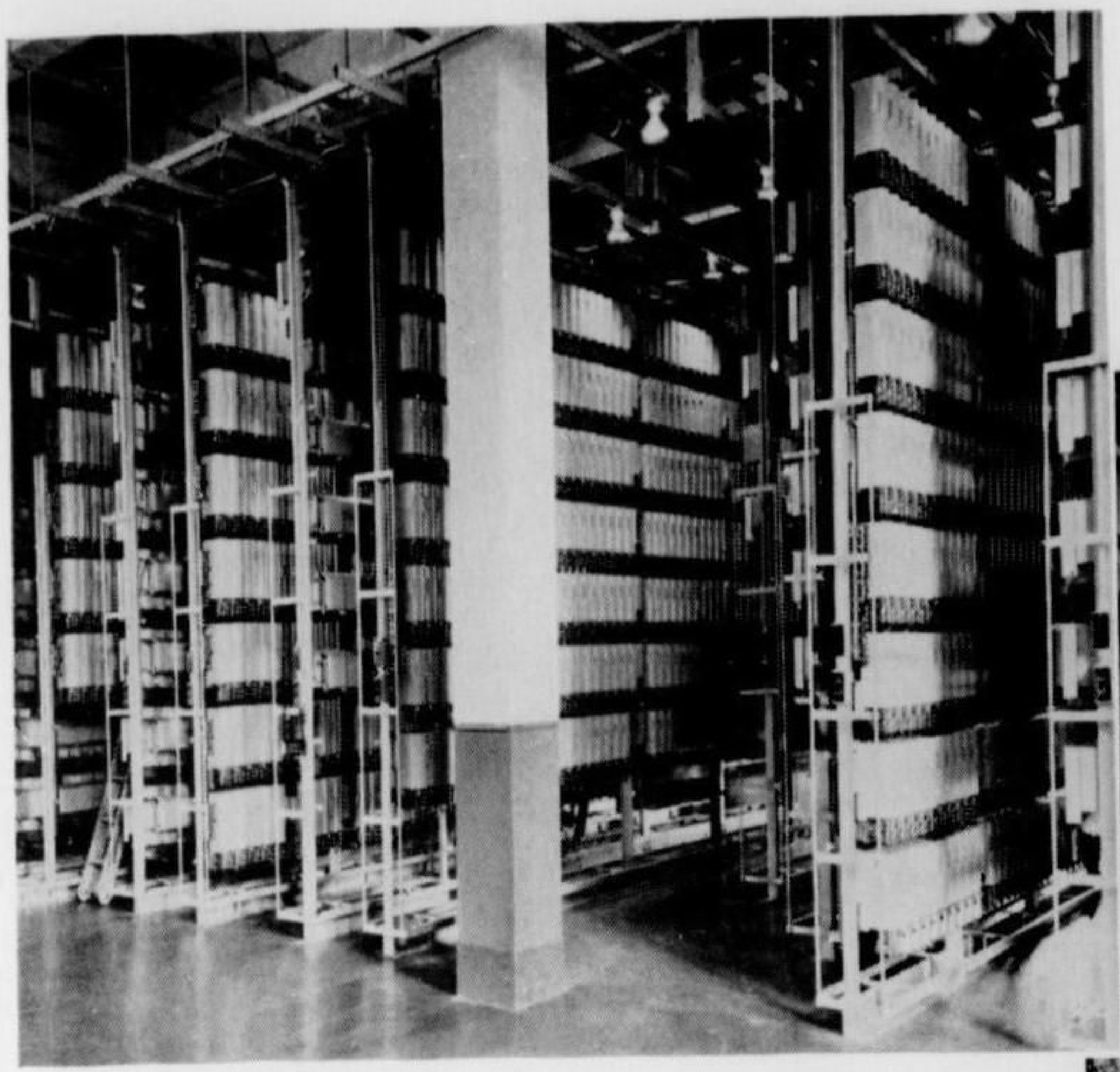
Bristol, England



Bombay, India

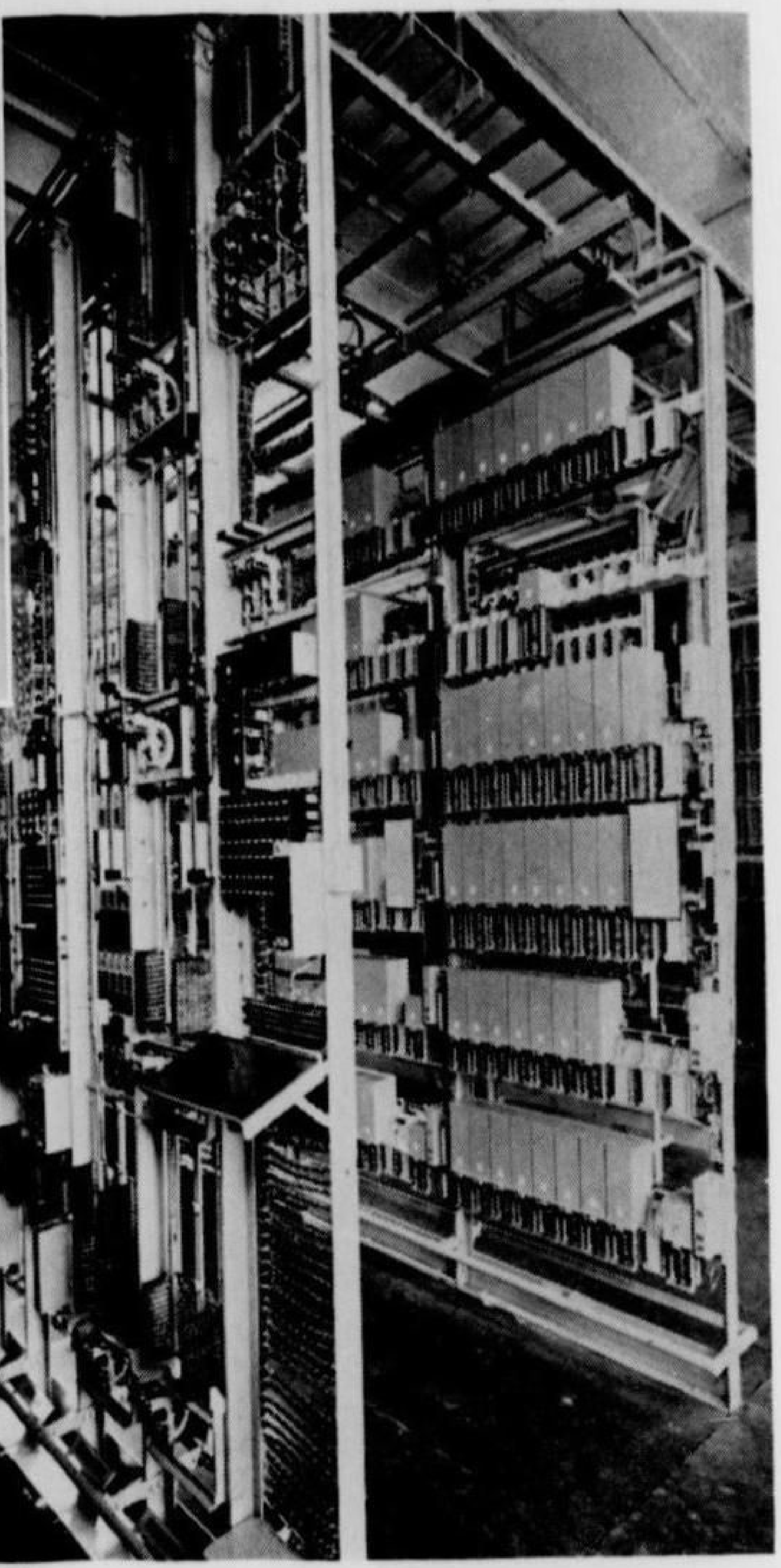


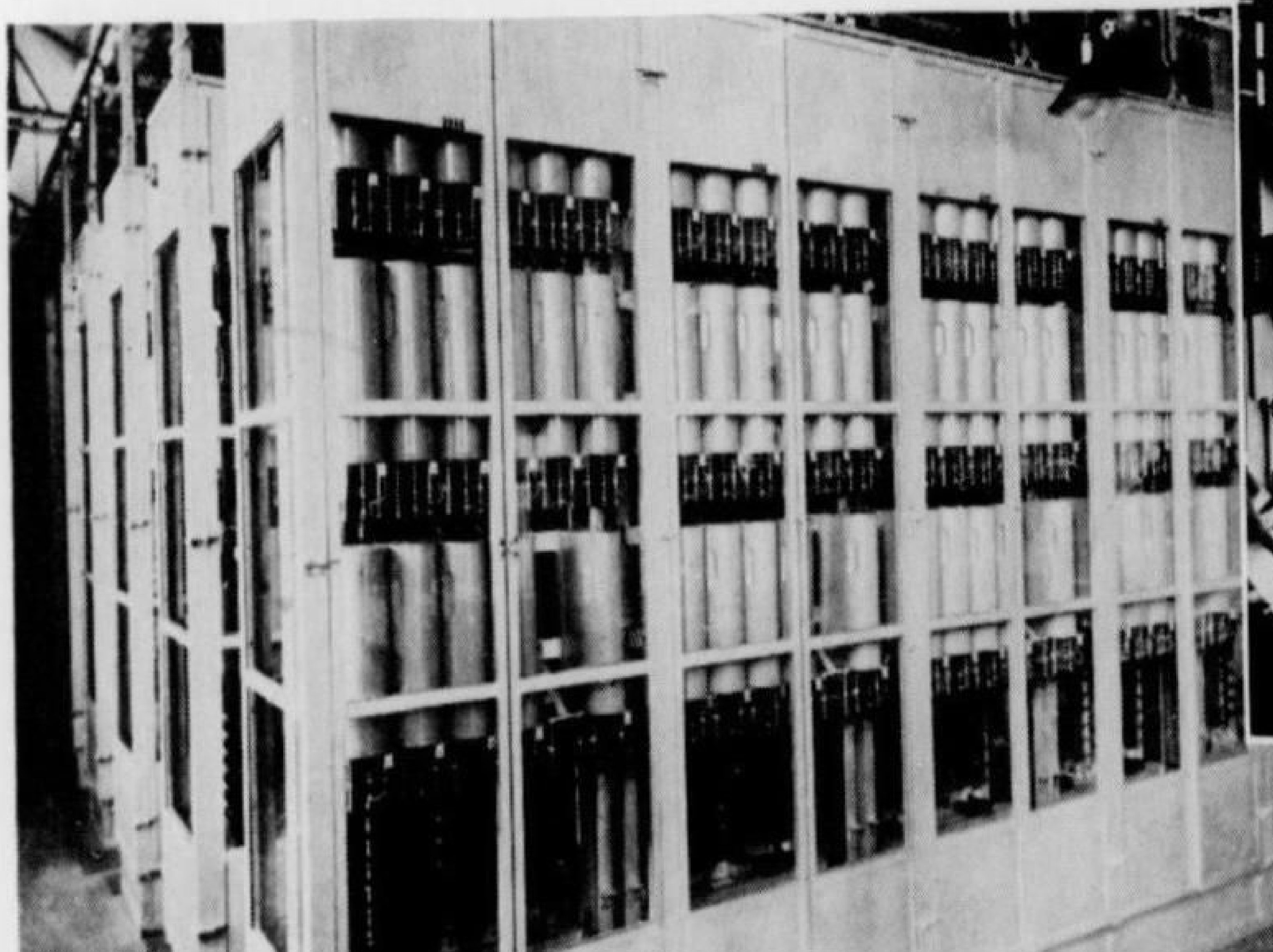
Strowger Automatic



Victoria, B. C., Canada

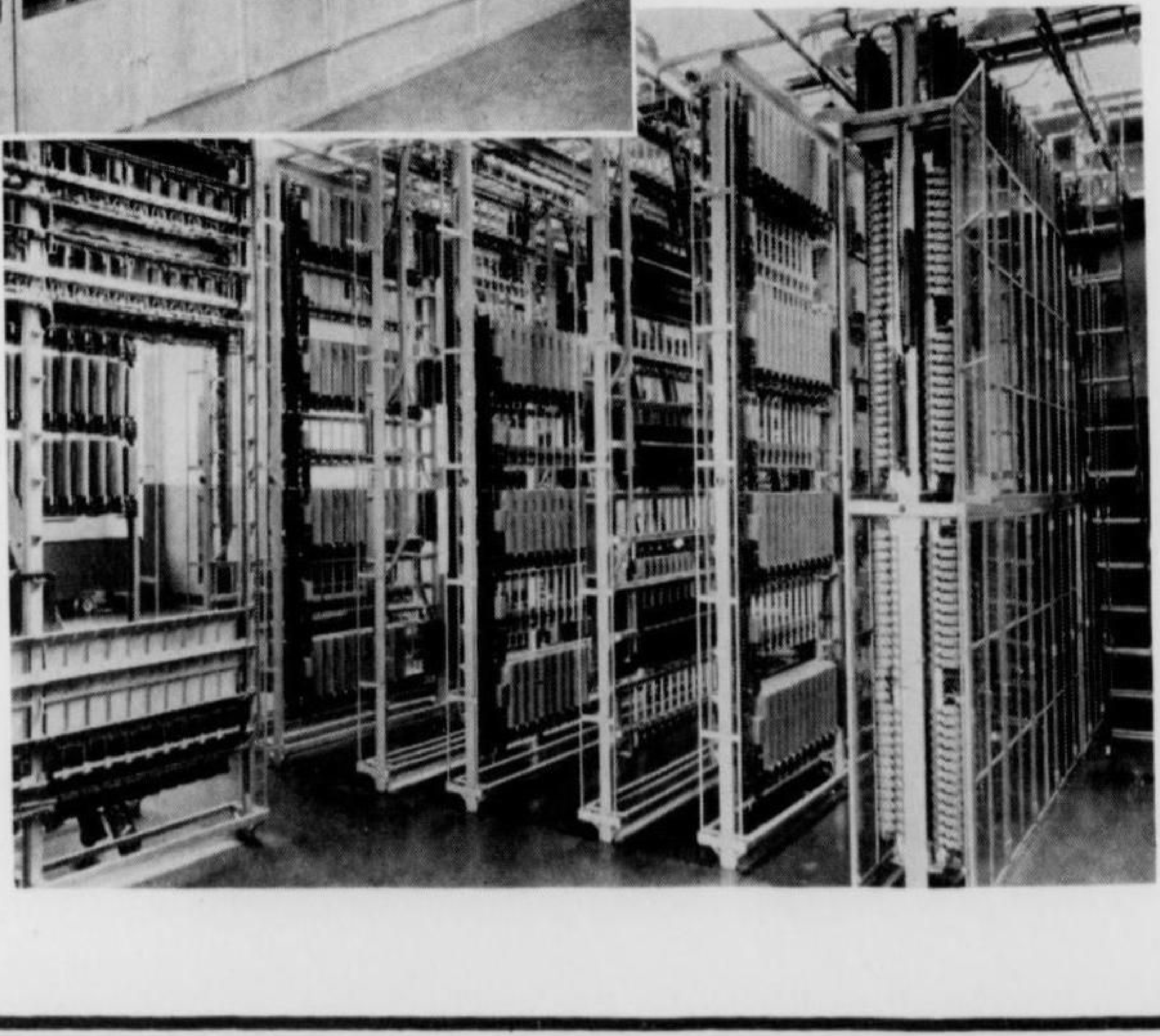
Sydney, Australia





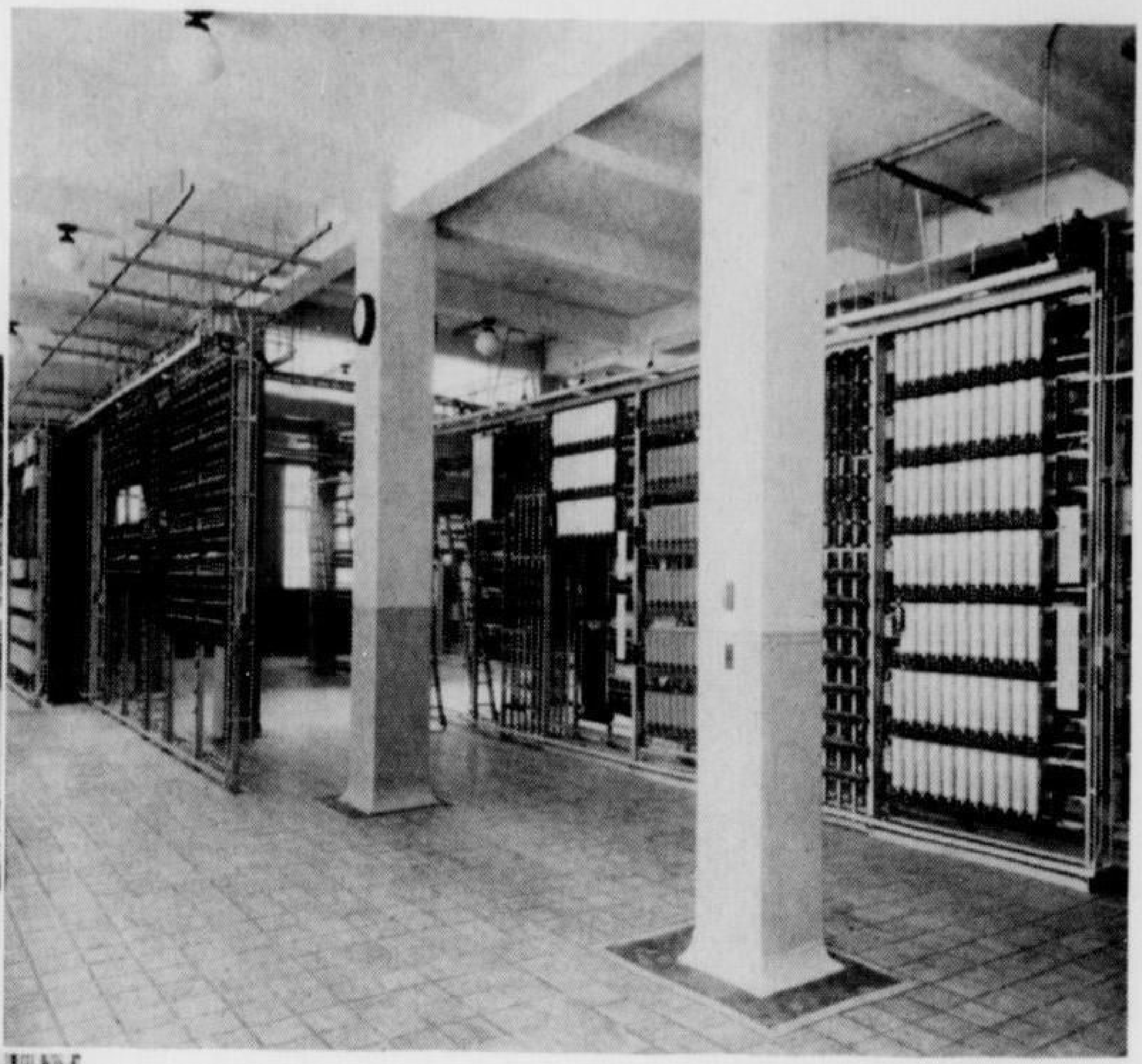
Caracas, Venezuela

St. Paul, Minn., U. S. A.



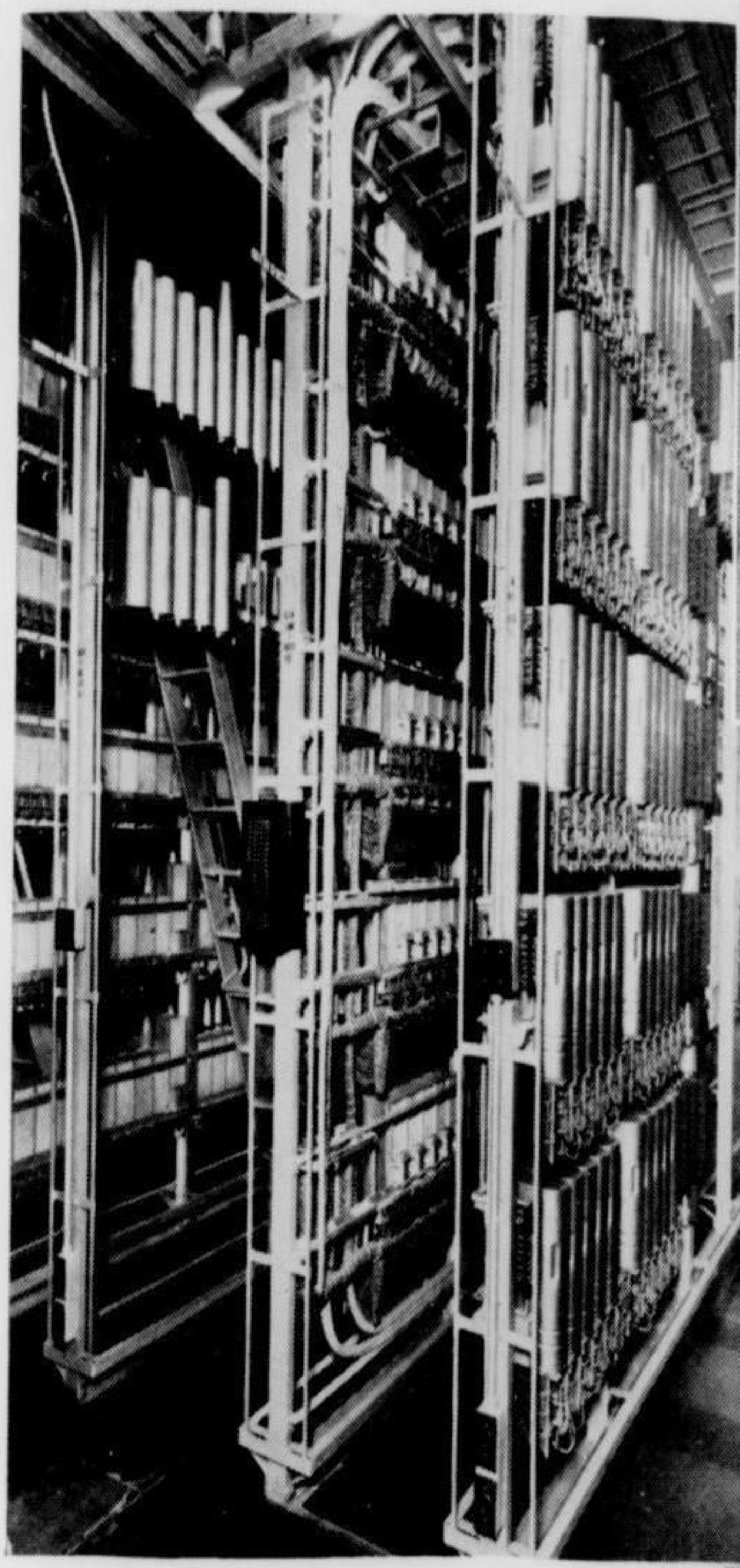
LEADING TELEPHONE ADMINISTRATIONS

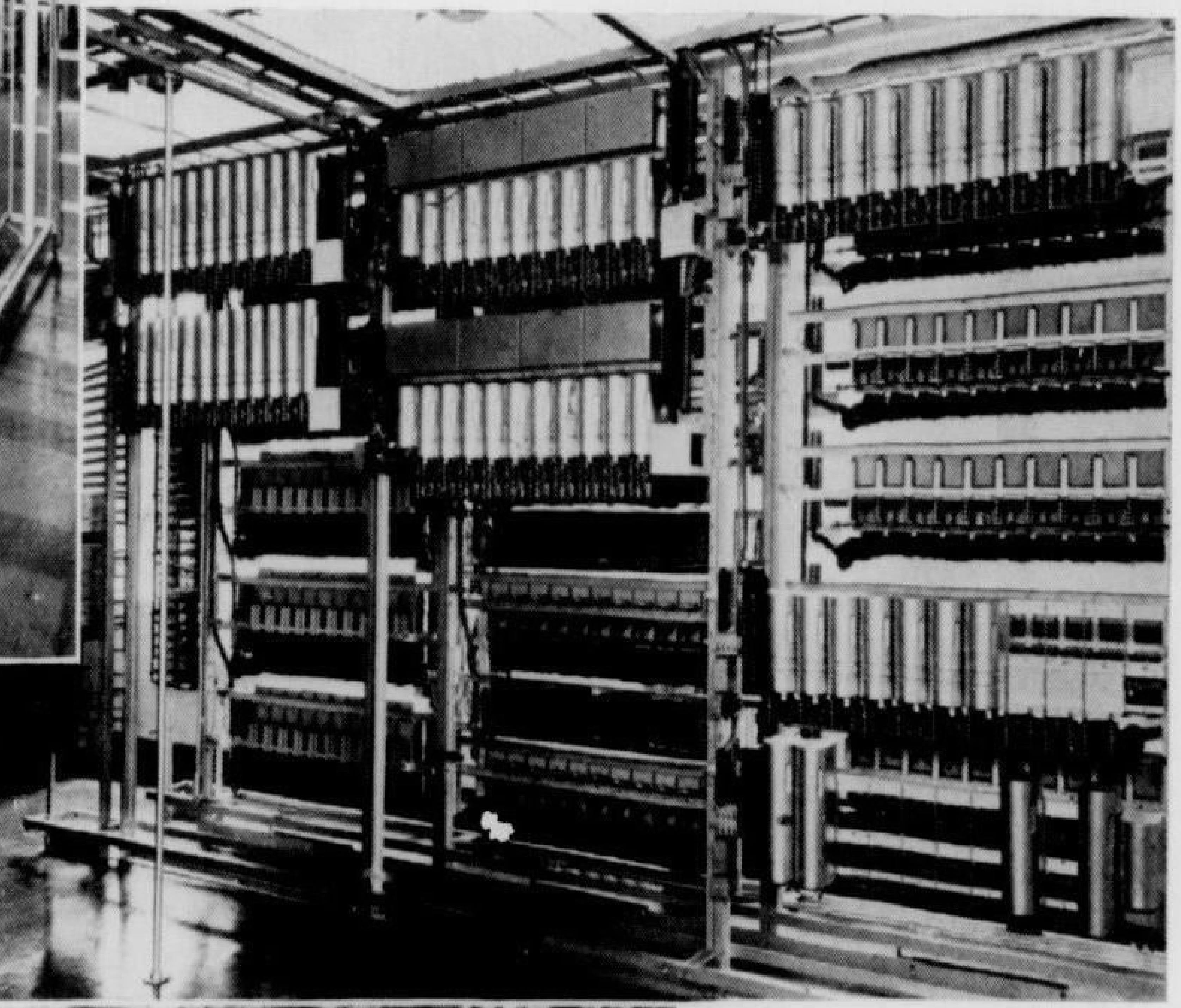
Telephone Systems



Calgary, Alta., Canada

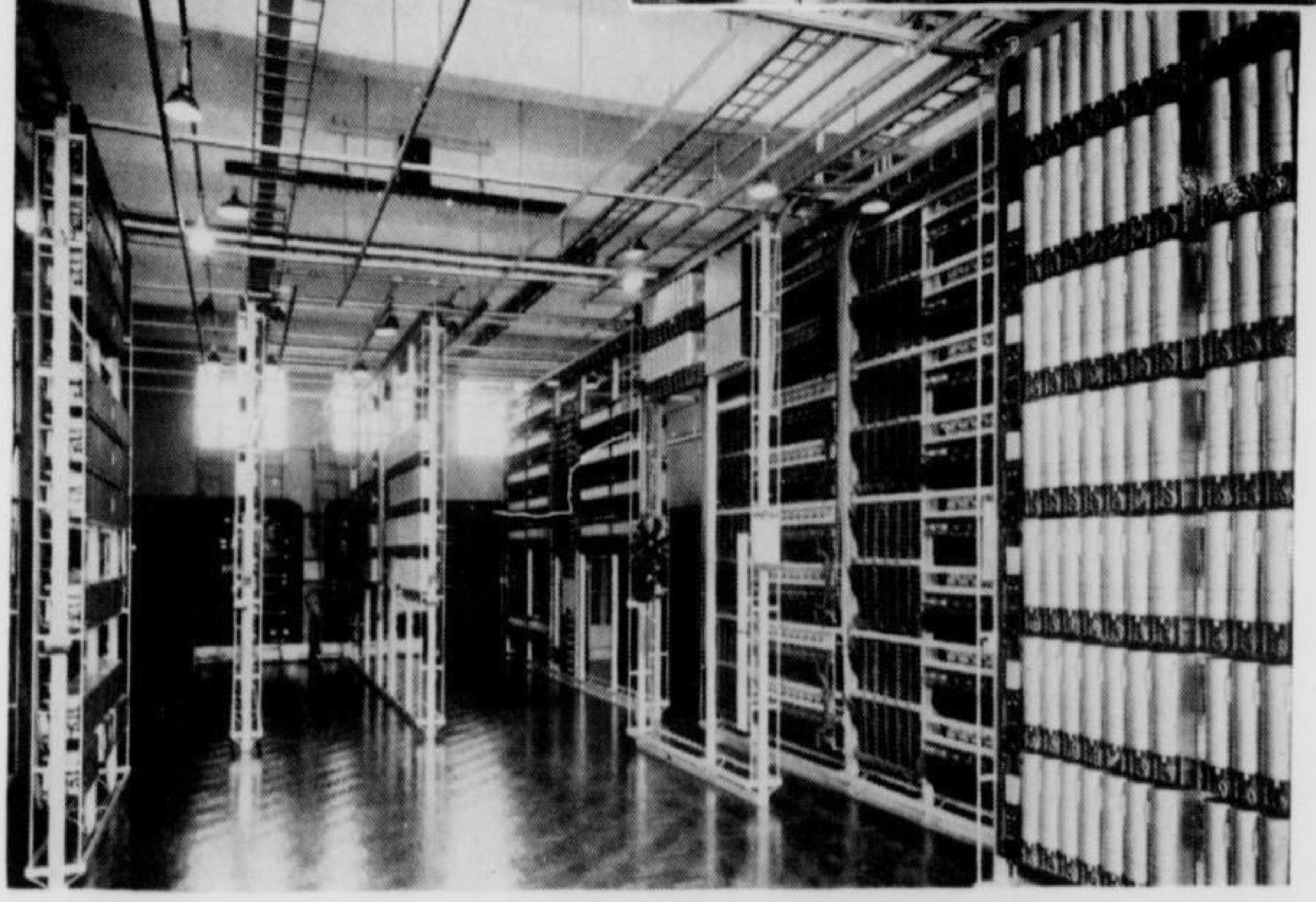
Sao Paulo, Brazil — Toll Switches





Wailuku, Hawaii

Sao Paulo, Brazil



AVE ADOPTED STROWGER EQUIPMENT

ADVANTAGES OF THE STROWGER SYSTEM

The specific benefits to be derived from the use of Strowger Automatic equipment are many and varied, but they may all be considered under two principal headings; namely, high quality of service to the user and economy to the operating organization.

The first requirement for the success of any telephone system is satisfaction of the telephone user. Close observance of this principle has been the guiding thought throughout the development of the Strowger Automatic system.

Simplicity and *dependability of apparatus* are important factors in quality of service. The basic Strowger equipment unit is a sturdy and compact electromagnetic mechanism, fundamentally of the simplest construction, operating on the step-by-step principle under the control of relays. The trunking arrangements are all on a straightforward decimal basis, and the circuit principles are very simple. Every component operates with a degree of speed, precision, accuracy and uniformity which is unequalled in any other type of apparatus. In addition, because of its simplicity, the system is readily understood and satisfactorily maintained by anyone possessing a working knowledge of ordinary telephone principles.

All Strowger components are designed and manufactured for *long service* and *unfailing reliability*. The long life of Strowger equipment is well-known wherever it has been used for many years. It is not uncommon to find Strowger exchanges that have been in continuous service for twenty-five to thirty years and that are still giving excellent service. With the greatly improved equipment available today, it is evident that depreciation and obsolescence in Strowger exchanges have been reduced to an exceedingly low point.

The flexibility of Strowger Automatic equipment is an important factor in its economy. The equipment is constructed and assembled in small self-contained units which are arranged to "jack-in" to the permanent wiring of the mounting shelves. Thus the equipment can be initially grouped in large or small quantities to meet the requirements of individual exchanges or networks, and at the same time the quantity of these switches can be readily increased or decreased or any of the equipment shifted, as changes in traffic may require.

Other advantages which may be important in specific exchanges under consideration include economy of floor space, improved transmission in both local and long distance circuits, simplicity of operation from the viewpoint of the subscriber (especially valuable in cosmopolitan districts), and adaptability of the equipment to highly specialized traffic and service practices.

MEETS ALL CLASSES OF SERVICE

At the present time, Strowger equipment is serving more than fifteen million telephones in all parts of the world. This widespread use embraces many different varieties of service and operating conditions and the Strowger system has met all of them with outstanding success.

In addition to ordinary service between individual line subscribers, the Strowger system provides for service to private branch exchanges (automatic or manual), service to party lines with either selective or code signaling, calls to or from pay-stations, and calls on a flat-rate or measured-service basis, as desired. In addition, Strowger equipment is available for the handling of short-haul or long distance toll calls on any basis desired by the operating administration, or to meet existing operating practices. There is a strong trend towards the greater use of automatic switching principles in setting up long distance calls, and the Automatic Elecric staff is prepared by long experience to make suitable recommendations for the methods best adapted to particular networks.

PRINCIPLES OF APPARATUS DESIGN

The Strowger Automatic system is based on simple and easily understood principles. The total number of lines in an exchange is divided and subdivided on a decimal basis, and selection of the desired line is accomplished by successive selection of groups and sub-groups, and finally by selection of the line itself.

Strowger Automatic

Strowger Automatic Switchboard, Partially Equipped. Note Provision for Easy Growth

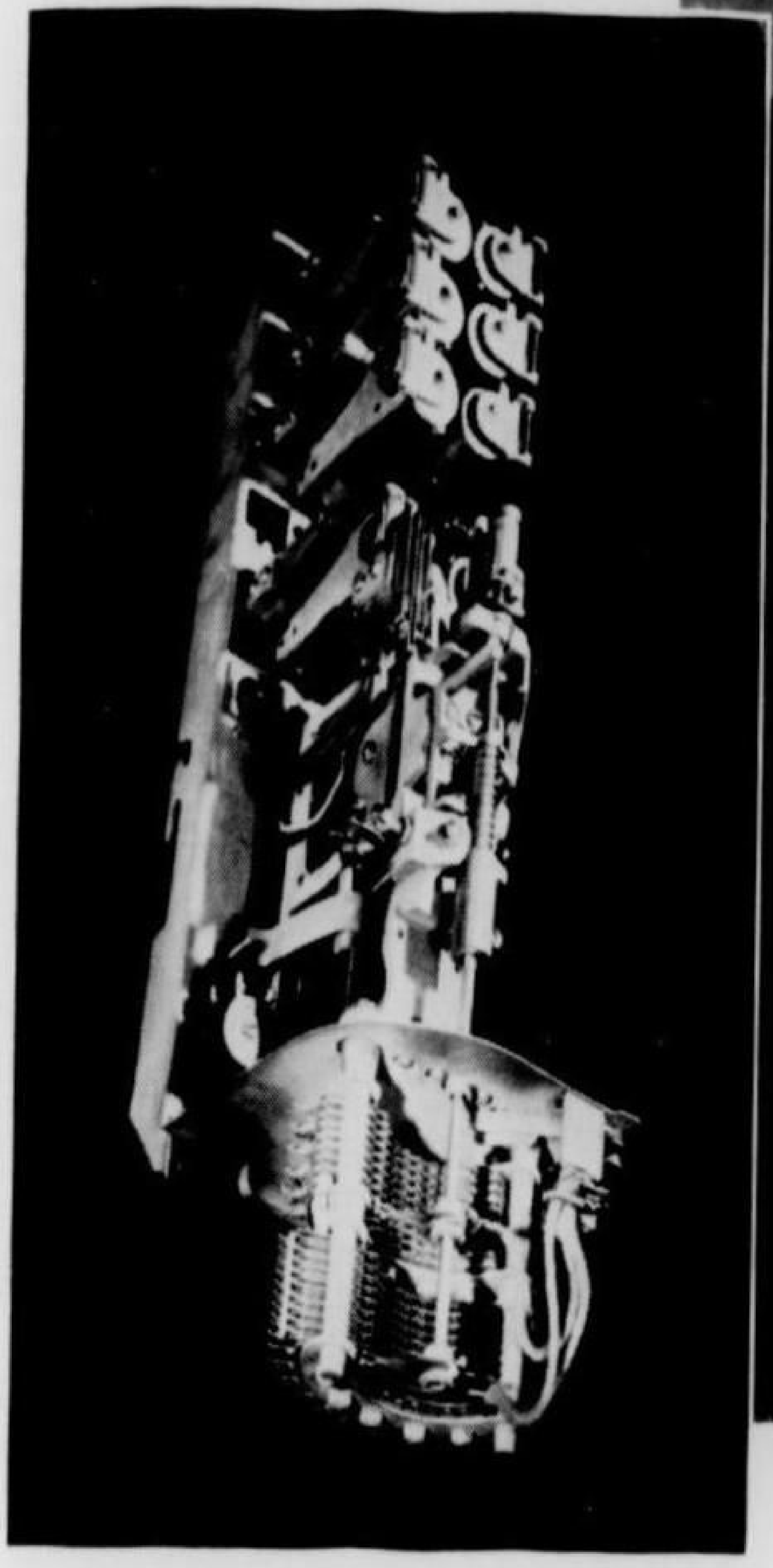
The Strowger switch — basic unit employed in this process of selection — is highly standardized in principle but exceedingly flexible in application. In most Strowger exchanges, the Strowger switches include line finders, selectors and connectors, and each type is available in a wide variety of modifications to meet the exact conditions of any particular exchange. Various other types of switches are also available as alternates to Strowger line finders. These include rotary line switches in various capacities, plunger type line switches, and — for small unattended exchanges — rotary type finder switches.

Still another available type of equipment employs no Strowger switches, but uses relays only. This type of apparatus is based on a new and simple type of multi-contact device known as the rotor relay, and, while adaptable primarily to small exchanges, is available on switchboards of any size and for any purpose.

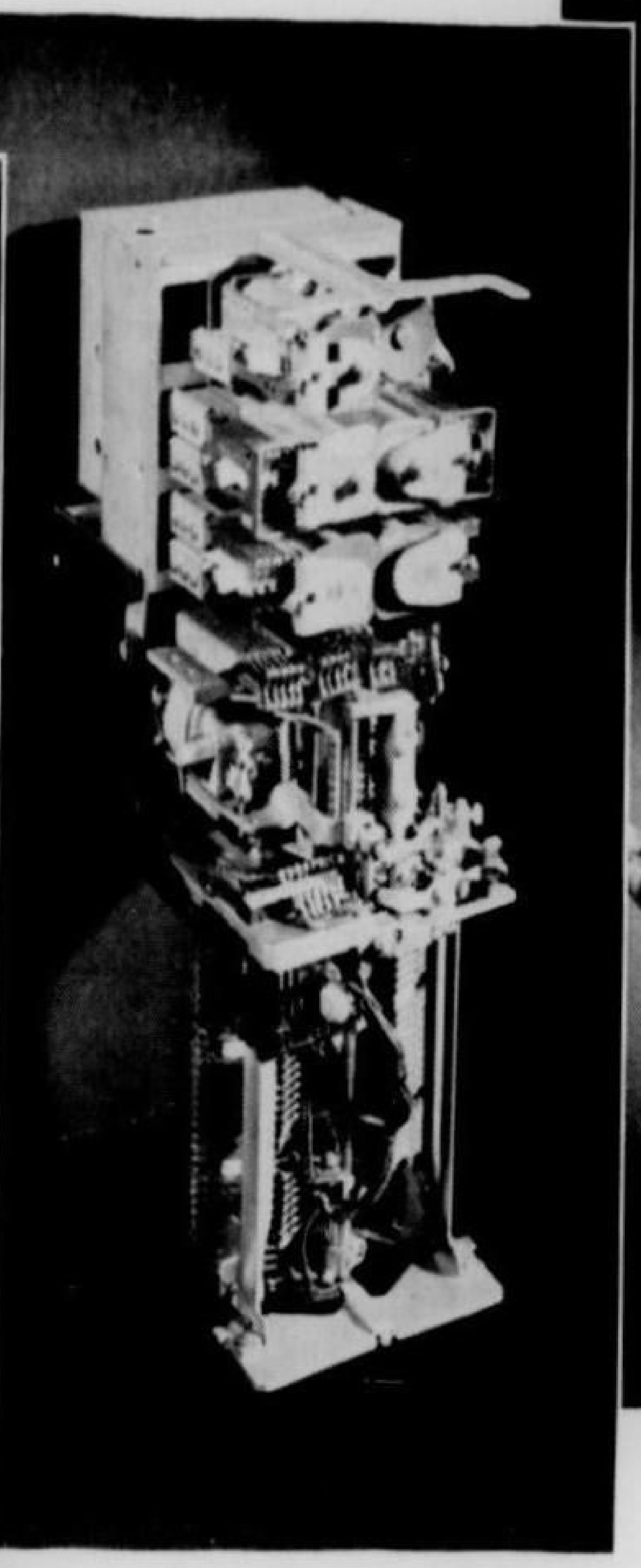
Having available this wide variety of standard apparatus, Automatic Electric engineers occupy the unique position of being able to supply the particular equipment that best meets the requirements of each exchange. As a result, their recommendations are based solely on the needs of that exchange and are unhampered by patent or manufacturing restrictions.

AUXILIARY EXCHANGE EQUIPMENT

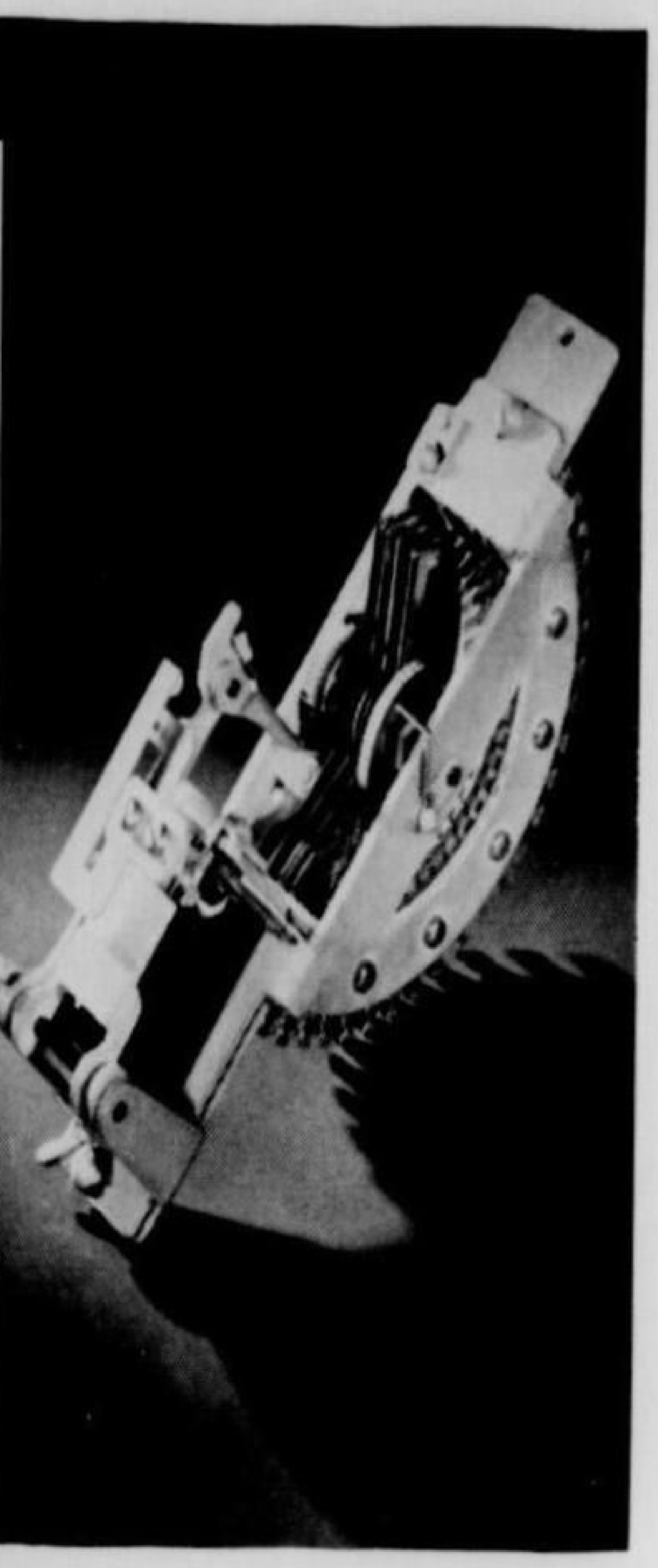
Automatic Electric Company is prepared to supply not only automatic central office equipment and subscribers' telephones of the most modern handset types,



Standard Strowger Connector

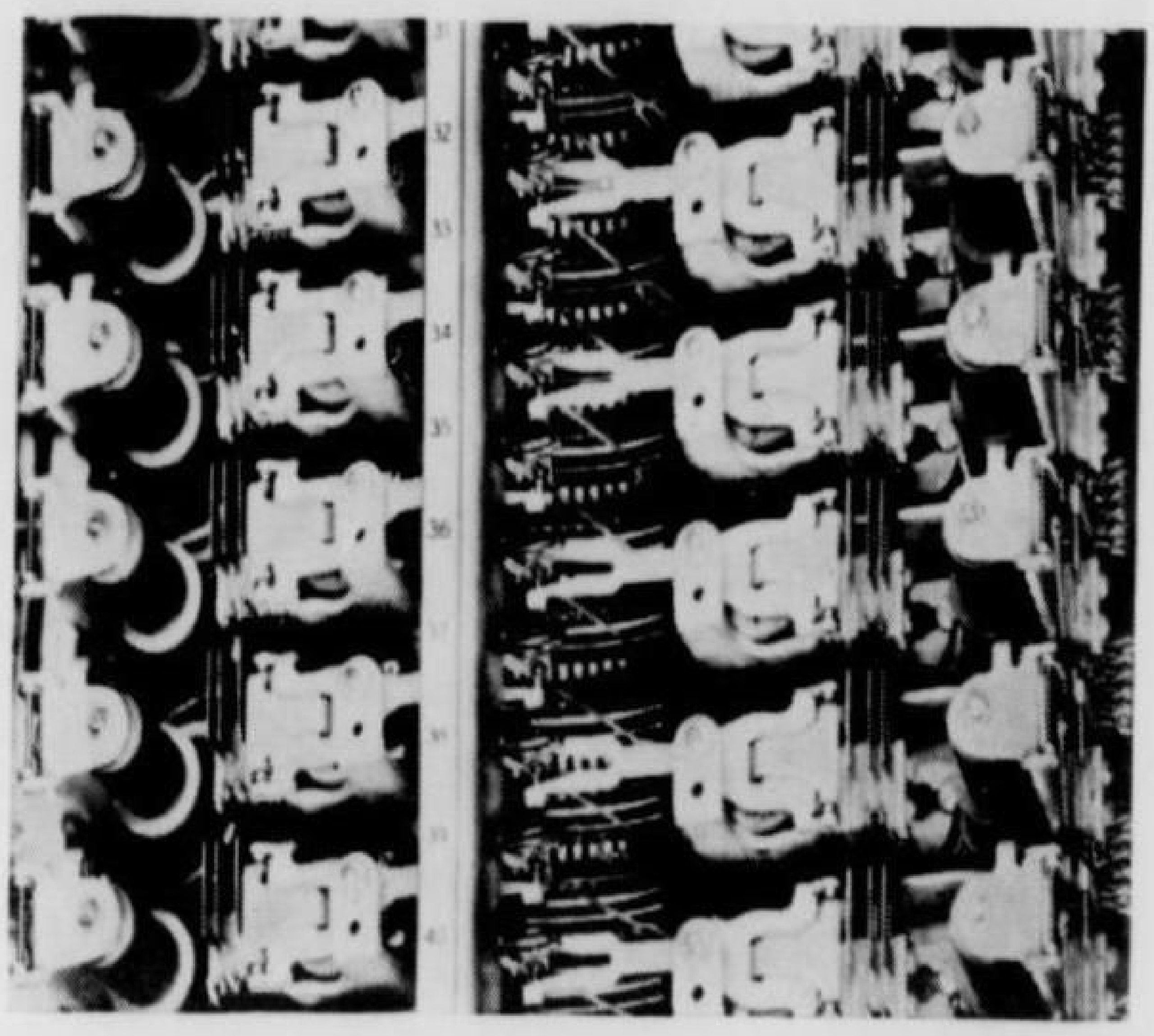


Strowger Selector — B.P.O. Type



Rotary Line Switch

but also all of the auxiliary equipment which is needed in a complete installation. In the typical case, this will include storage batteries, charging machines, power switchboards, distributing frames, and miscellaneous manual desks such as toll boards, wire chief's test desks, information desks, etc.



Plunger Type Line Switches

Toll switchboards are available either in the familiar "cord and plug" (or manual) type or in the remote control type, as preferred. In the latter type, the actual

switching functions are performed by standard Strowger switches under the control of operators at simple keyset control positions. Strowger Remote Control Toll Boards are becoming increasingly popular in exchanges where toll traffic represents an important item of service and revenue.

The Automatic Electric line of equipment includes also all types of manual switchboards, both magneto and central battery, in any desired capacity, and for either public exchange or private exchange service.

ENGINEERING AND CONSULTATION SERVICE

Automatic Electric Company is prepared to supply and install complete central office installations with all accessory equipment, and also to contract for complete construction of new exchanges including outside plant, in any part of the world where transport and local conditions permit. The Company is also prepared to arrange financing or assist in financing of installations that are planned on a sound economic basis. Strowger representatives are available for consultation in practically every country in the world, and inquiries directed to them will receive prompt and careful attention.

AUTOMATIC ELECTRIC COMPANY

TYPICAL STROWGER USERS

Listed below are a few of the many telephone operating organizations in the world to whom Automatic Electric Company and its subsidiaries, affiliates, and licensees have supplied, or are supplying, Strowger Automatic telephone equipment.

UNITED STATES
- Over 180 Independent telephone companies
- Operating companies of the Bell System
- United States Government—all departments

CANADA
- British Columbia Telephone Company
- Alberta Government Telephones
- Manitoba Telephone System
- Saskatchewan Government Telephone System
- Bell Telephone Company of Canada

COLOMBIA
- Compania Telefonica Central
- Compania Telefonica de Barranquilla
- Compania Telefonica de Cartagena
- Compania Telefonica del Pacifico
- Bogota Telephone Company, Limited

VENEZUELA
- Compania Telefonica de Venezuela

BRAZIL
- Companhia Telephonica Brasileira

CUBA
- Cuban Telephone Company

SANTO DOMINGO
- Cia. Dominicana de Telefonos C. por A

ARGENTINE
- United River Plate Telephone Company, Ltd.

AUSTRALIA
- Post Office Department (Operates Strowger equipment in various important cities)

PHILIPPINE ISLANDS
- Philippine Long Distance Telephone Company

GERMANY
- German Postal Administration (Operates Strowger-type equipment in various important cities)

ITALY
- Italian State Telephone Administration
- Società Telefonica Interregionale Piemontese e Lombarda
- Società Telefonica Delle Venezie
- Telefoni Italia Medio Orientale
- Società Telefonica Tirrena

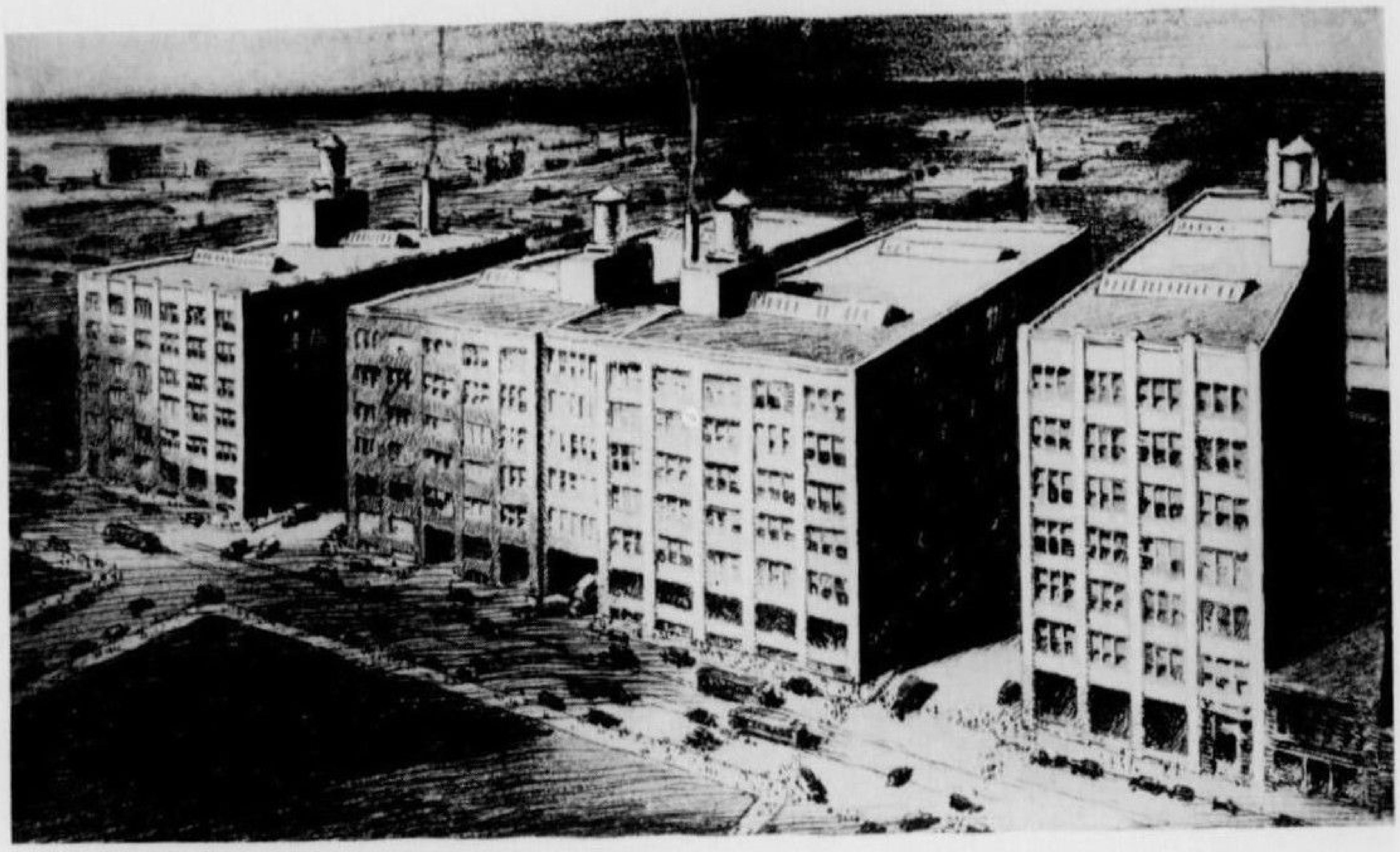
CHINA
- Chinese Ministry of Communications (Operates Strowger equipment in various important cities)

JAPAN
- Post office Department (Operates Strowger equipment in various important cities)

and telephone administrations in more than fifty other countries.

TYPICAL OF THE WORLD'S WELL-KNOWN CITIES NOW BEING SERVED BY STROWGER-TYPE TELEPHONE EQUIPMENT ARE THE FOLLOWING:

LONDON, MANCHESTER, BIRMINGHAM, and other principal cities of Great Britain; BERLIN, HAMBURG, MUNCHEN, and other principal cities of Germany; ROME, MILAN, TURIN, and other cities in Italy; BUENOS AIRES, Argentine; PHILADELPHIA, LOS ANGELES and ST. PAUL, United States; SYDNEY and MELBOURNE in Australia; LISBON, Portugal; HAVANA, Cuba; HONGKONG; TORONTO, WINNIPEG, and VANCOUVER, Canada; TOKYO and YOKOHAMA, Japan; JOHANNESBURG, South Africa; BOMBAY and CALCUTTA, India.



Factory and General Offices of Automatic Electric Company, Chicago, U. S. A.

Principal Telephone Products
# of AUTOMATIC ELECTRIC COMPANY

Strowger Automatic Telephone Systems—Complete automatic central office equipment for exchange areas of any size, from small towns to the largest metropolitan networks.

Community Automatic Exchanges—Unattended Strowger units for small rural or suburban areas, with facilities for switching into attended exchanges.

Remote Control Toll Boards—An adaptation of Strowger principles to toll switching, resulting in simplification of operators' equipment and greater economy of operating and toll circuit time.

Private Automatic Exchanges—Available in various capacities, with or without central office connections, and with facilities for special control services to meet the needs of the user.

Manual Telephone Switchboards—A complete range of central battery and magneto types for public and private exchange use.

Telephone Instruments—Modern designs for automatic or manual exchanges, including the Monophone—the world's most attractive and efficient handset telephone.

Exchange Accessory Equipment—Auxiliary exchange and substation equipment, including manual desks, testing apparatus, transmission equipment, and all accessories needed for the operation and maintenance of the modern telephone exchange.

Makers also of electrical control apparatus for industrial, engineering and public utility companies, telephone apparatus for railroads and pipe line companies, private telephone systems of all types, electrical and communication devices for aircraft and airways control, and special communication apparatus for military and naval departments.

AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

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